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Opportunities for the integration of institutional arrangements for riparian buffer zone management in Ontario, Canada

Jeffrey Willard King
Wilfrid Laurier University

OPPORTUNITIES FOR THE INTEGRATION OF INSTITUTIONAL ARRANGEMENTS FOR RIPARIAN BUFFER ZONE MANAGEMENT IN ONTARIO, CANADA

By

Jeffrey W. King
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Abstract

A need exists in Ontario for improved management of land and water resources. In addition the need for increased integration within and among the agencies responsible for these resources is imperative. Between these two resources is the riparian zone, for which riparian vegetative buffer zones are a recognized Best Management Practice (BMP) for water quality improvement. However, the problem remains that each agency views buffers from a particular perspective. Hence, buffers are being implemented primarily for a single purpose without considering the multiple use of buffers To achieve an integrated management framework for riparian buffers, it is necessary to evaluate the institutional arrangements (legal, administrative, financial) that currently exist in the province of Ontario for buffers. This is to determine opportunities and constraints to integrated riparian buffer management.

The recent changes in land use planning in Ontario and the increase in watershed planning studies provide an opportunity to create a management framework for riparian buffers among the institutional actors Given these opportunities and a need to coordinate activities, it is necessary to determine if an integrated approach can be applied to a riparian buffer management framework. To this end, an institutional analysis is undertaken to examine the applicable provincial and municipal agencies operating in the Grand River watershed in southern Ontario The analytical framework considers five aspects: context, legitimation, functions, structures, and organizational culture and attitudes.

The results of the institutional analysis indicates that several statutes, including the Planning Act, Weed Control Act, and the Fisheries Act, influence buffers although there is limited buffer policy and limited financial assistance to promote buffer creation. Nonetheless, agency integration for buffers requires improvement, and several opportunities exist to facilitate integration. These opportunities include the establishment of a lead agency to coordinate buffer establishment and management, the use of watershed planning, and the creation of a common policy or strategy for buffers among the various agencies for buffers. Watershed planning is becoming more widely adopted in Ontario, and is an excellent mechanism to integrate buffer management.

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1.1 Introduction

There is an increasing recognition in the Province of Ontario for the need of land-use planning and environmental management in general to move towards an ecological foundation, with the ecosystem as a focus. This vision is evident in the final report of the Royal Commission on the Future of the Toronto Waterfront (1992), in the restructuring of the Ontario Ministry of Natural Resources planning process (1994), in the final report of the Commission on Planning and Development Reform in Ontario (1993), and in the various ministries Statements of Environmental Values (MOEE, 1994b,d).

One major limitation of managing the environment on an ecological basis is that institutional and political boundaries are inconsistent with ecological boundaries. The management unit favoured with an ecological foundation is the watershed or subwatershed (Royal Commission on the Future of the Toronto Waterfront, 1992). However, institutional and political boundary problems still exist at the watershed level.

Perhaps the best way to achieve environmental management on an ecological basis is through an integrated management approach Integrated management suggests consideration of a select number of key elements and their interactions. This, in contrast to a comprehensive approach, which implies consideration of all elements and interactions involved in the management process. The rationale for an integrated approach over a comprehensive approach is that the comprehensive approach "is too ambitious for current skills and capabilities and that resource managers should be thinking in terms of integration, a more

focused and selective approach" (Mitchell, 1989: 305) A key reason for using an integrated approach is that planning and management requires action, and it is not always feasible or practical to wait for an analysis of all information before taking action In addition, a comprehensive approach rarely or never results in complete understanding The integrated approach recognizes and accepts the level of uncertainty in the management process created by incomplete knowledge Considering the fact that it is impossible to eliminate all uncertainty, we can only attempt to reduce the level of uncertainty An integrated approach for environmental management aids in resolving boundary problems by facilitating interaction and communication between overlapping agency districts

The management of riparian buffers illustrates decision making that could benefit from the use of an integrated approach. Riparian buffer zones, also known as buffer strips, vegetative filter strips, riparian plantings, grass strips, filter strips, or a combination of these terms, are an important land use management tool to control non-point source pollution (i e , OMAF, 1993). Riparian buffers are important because the riparian zone is the transition between two main resources: water and land. Generally, riparian buffer zones protect or reduce the impact of adjacent land uses on the water resource A buffer can be defined as "bands of planted or indigenous vegetation situated downslope of cropland or animal production facilities to provide localized erosion protection and filter nutrients, sediment and other pollutants from agricultural runoff before reaching receiving waters" (Dillaha et al , 1989), although a riparian buffer is located within the riparian zone. While this definition refers to agriculture, the use of riparian buffers is not limited to the agricultural sector Riparian buffers occur in other sectors, such as forestry, mining and development Regardless of the

sector, the primary purpose of riparian buffers is as a Best Management Practice (BMP) to control non-point source pollution

Riparian buffer use in Ontario is slowly emerging. A study by Smit and Smithers (1992) revealed that nine percent of surveyed farmers were using buffers as a conservation measure Of these users, thirty-eight percent had used buffers only within the previous five years Riparian buffers are also becoming recognized in the urban setting, especially as a development mitigation measure. For example, riparian buffers were recommended by the Laurel Creek Watershed Study in the Regional Municipality of Waterloo (GRCA, 1992), and the Hanlon Creek Watershed Study in Wellington County (City of Guelph, 1993). Such studies also reflect the watershed (or sub-watershed) as a basis for management.

The need for an integrated management approach for riparian buffers is becoming crucial in the changing institutional framework of Ontario. As institutional boundaries do not necessarily conform to ecological boundaries, problems result if management is to occur on an ecosystem basis, management that has proven difficult when sectoral provincial agencies were primarily the core of resource planning and management. With provincial devolution of land use planning powers to municipalities, the number of resource management actors has increased, complicating management even on the subwatershed level, as a subwatershed may be divided among several municipalities. Therefore, an integrated approach may be the best method to achieve the overall goals of provincial policies.

1.2 Problem Summary

A need exists to improve riparian buffer management through increased integration within and between responsible agencies. To improve management, barriers both within and

between agencies must be overcome, including the problem of "turf" battles between government agencies; present uses being considered a right rather than open to compromise, the political process being oriented towards specialized issues rather than an integrated approach; and society being oriented towards growth rather than maintenance, to name a few (Cairns, 1991). Many of these problems result from a difficulty in modifying government policy and management for political units and ecological units.

Many agencies either recommend or have a role in riparian buffer zone management However, recommendations and guidelines are not coordinated and at times conflict with one another, especially if the buffer is considered for multiple purposes This could be resolved if agencies develop a common strategy or policy regarding buffers, with a coordinated delivery and management framework.

1.3 Purpose

The purpose of this thesis is to examine elements of the management arrangements of specific agencies that facilitate and/or hinder an integrated approach to environmental management for riparian buffer zones. These arrangements include the legal, administrative and financial arrangements. To accomplish this, the institutional frameworks of specific provincial and municipal agencies are considered, with the Grand River watershed as a study focus. An evaluative framework (described separately) is used to analyze the current institutional arrangements. By examining the framework through which decisions are made and management implemented, opportunities and constraints that currently exist for integrated management can be identified. Future management strategies can be proposed thereby maximizing the opportunities, while at the same time minimizing the constraints.

1.4 Objectives

To achieve this purpose, five objectives have been developed:

1 To identify the current provincial and municipal institutional arrangements, as they apply to riparian buffers in Ontario.

2. To examine the problems related to institutional arrangements and the conflict with ecological units, as applicable to riparian buffers

3 To determine the level of integration that exists among government agencies regarding riparian buffers.

4 To identify the opportunities and constraints among agencies that exist for establishing an integrated approach regarding riparian buffers.

5 To propose an integrated management framework for riparian buffer zones in the Province of Ontario.

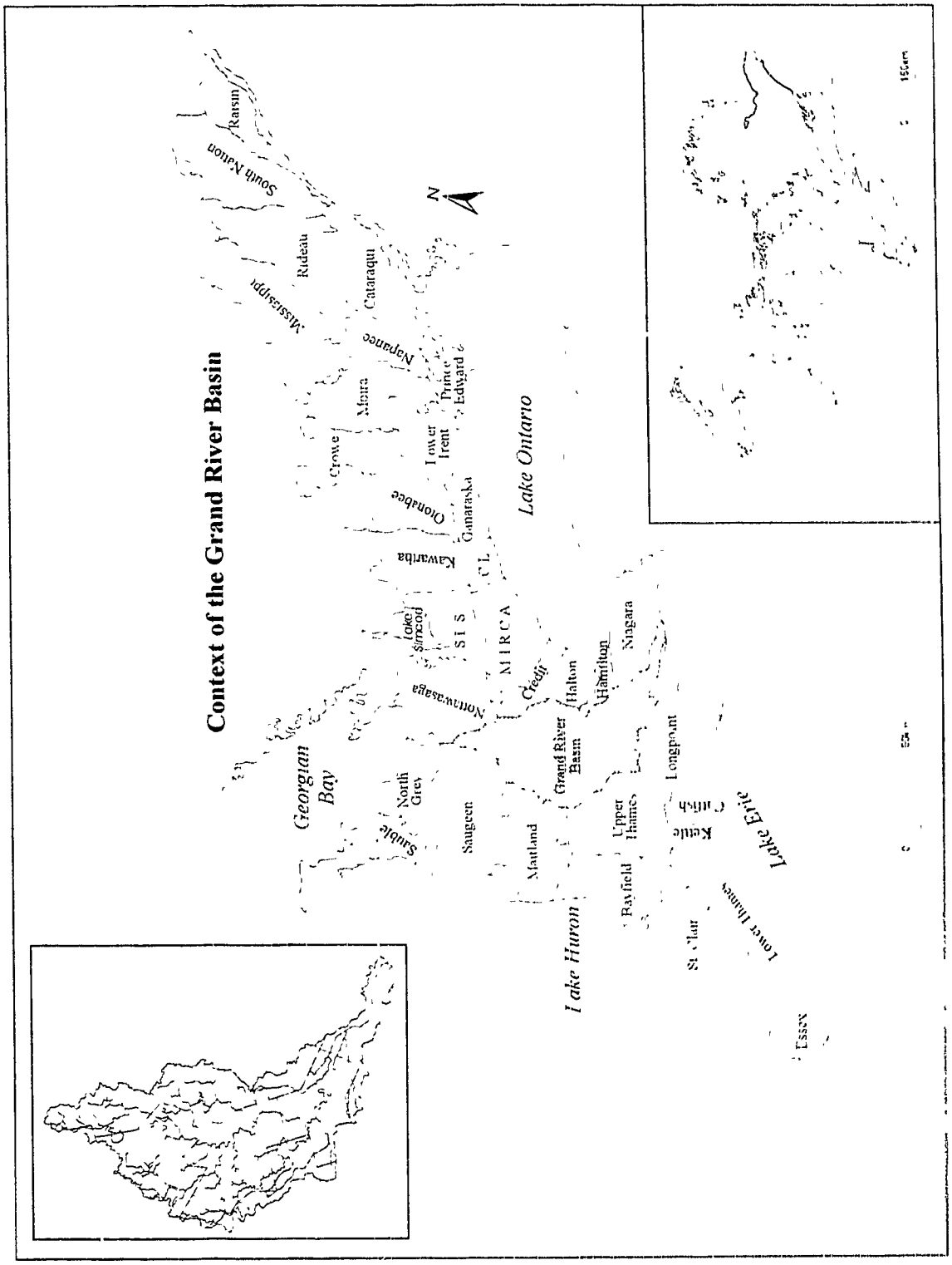
Of these, the final two objectives are most important to this research, as an integrated approach can only be developed after the opportunities and constraints are identified.

1.5 Study Area

Located in south-central Ontario and originating near the Village of Dundalk, the Grand River has four major tributary rivers (Nith, Speed, Conestogo, and Eramosa). The river winds over 300 kilometres in a southeast direction to Lake Erie and collects water from a drainage area of 6 965 km^2 (Figure 1.1) (GRCA, 1992a). The landscape of the Grand River watershed has been altered as a result of two hundred years of intense settlement, and is today a mixture of urban and rural land uses. The urban centres are the cities of Kitchener, Waterloo, Cambridge, Guelph, and Brantford. They are all located in the central portion of the watershed. The remainder of the watershed consists of towns and villages interspersed throughout a predominately agricultural landscape.

As a case study focus, the Regional Municipality of Waterloo and the County of Oxford are examined in closer detail. The Regional Municipality of Waterloo is unique to the

Figure 1.1 Location of the Grand River Watershed in Various Contexts



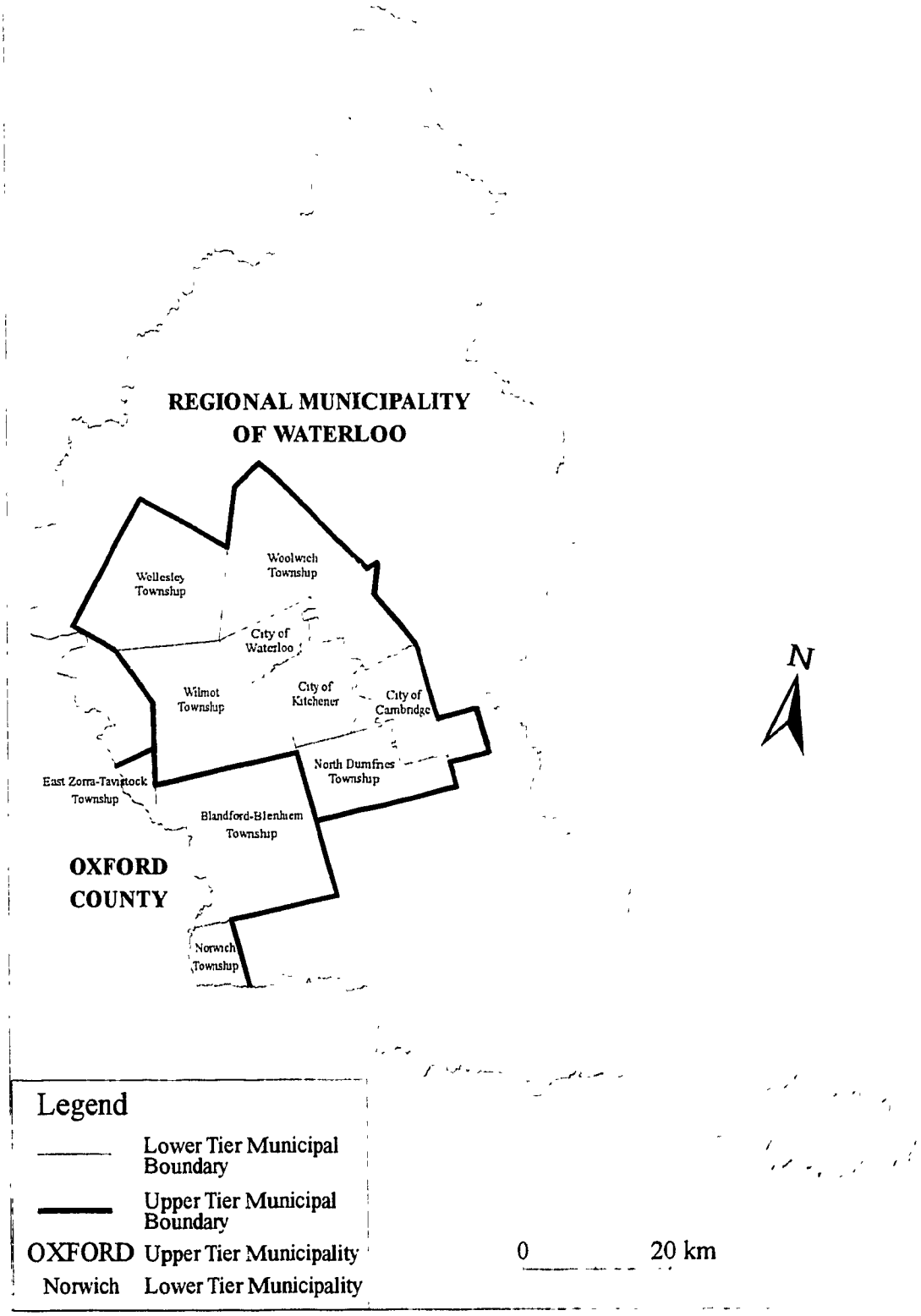
watershed in that the complete upper tier municipal boundaries lie completely within the watershed boundaries (Figure 1.2). The Region of Waterloo consists of seven lower tier municipalities, including the rural townships of Wilmot, Wellesley, Woolwich, and North Dumfries; and three cities: Waterloo, Kitchener, and Cambridge. Each of these has control over land use planning, and has an Official Land Use Plan. The Region of Waterloo has been chosen for several reasons. First, the municipality is located completely within the watershed, and as such, does not experience boundary problems resulting from being located in multiple watersheds. Second, the Region is known for a strong role in environmental issues. Third, the Region recently completed a new Official Plan that incorporates the new provincial policy statements, and fourth, the Region is a two tier planning system with planning power divided between the two municipal levels.

The County of Oxford lies on the south-west corner of the Region of Waterloo, yet unlike its neighbour, lies only partially within the Grand River watershed. This area of Oxford is rural in nature, with the townships of East Zorra - Tavistock and Norwich only having small portions of their administrative areas within the watershed, while most of Blandford-Blenheim Township lies completely within the watershed. In terms of planning, Oxford also differs, as planning for the townships is conducted from a central planning department at the County level. Oxford has been chosen for numerous reasons. First, only a portion of the county is located within the watershed, and thus experiences boundary problems. Second, Oxford is developing a new Official Plan, in which buffers are explicitly mentioned. Third, Oxford is a one tier planning system, with planning functions located at the County level. Fourth, the County is directly adjacent to Waterloo to allow for comparisons of contact between adjacent municipalities.

1.6 Thesis Overview

The remainder of this thesis investigates the institutional arrangements in Ontario for riparian buffer zone management. This institutional analysis is designed to offer insight into the

Figure 1.2 Research Case Studies: Location Within the Grand River Watershed



planning and management arrangements for riparian buffer zones in Ontario with a specific focus on a natural ecological system, the Grand River watershed and the various institutions operating within this watershed. This analysis permits the identification of opportunities and the constraints for an improved and integrated management system. Recommendations are provided at the normative and strategic levels in an attempt to indicate aspects required to achieve an integrated buffer zone management. An operational level is not provided since decisions on what will be done for planning and management is extraneous to this research.

The research investigation begins in Chapter Two with a literature review of several important concepts in resource management. This review includes brief discussions on integrated environmental management, watershed planning, stewardship, natural heritage landscapes, and institutional analysis. Chapter Three provides an overview of the research methodology and the analytical framework, and Chapter Four deals with a review of literature and technical aspects of buffer zones, and is related to addressing the first two research objectives. Chapter Five begins the institutional analysis of the provincial and municipal government agencies, responding to research objectives one, two, and three. Chapter Six follows with further discussion of planning and management issues for buffers by focusing upon objectives one and four. Pursuant to objective five, Chapter Seven summarizes the research findings and provides recommendations for an integrated management framework for riparian buffers. This chapter also indicates research limitations, and provides suggestions for future research

Chapter Two

Resource Management Concepts

2.1 Introduction

To promote the discussion of integrated riparian buffer zone management in Ontario, it is necessary to explore several key concepts. The first concept is an integrated approach, as it applies to resource management. Consideration of the term "institutional arrangements", from a definition and usage perspective in resource management, follows. It is also necessary to review several other key concepts: an ecological planning approach, watershed planning, stewardship, and natural heritage systems.

Resource management can occur at three distinct levels, with each requiring consideration in an analytic process (Smith, 1982: 562) The first level, the normative, concerns decisions aimed at what *ought* to be done The second level, the strategic, is more pragmatic in nature by looking at what management practices *can* actually be undertaken The third level, the operational, determines what *will* actually occur, and deals with actual plan implementation. Research on resource management issues has focused primarily on the normative and strategic levels.

2.2 Integrated Environmental Management

There are several approaches to the management of natural resources For example, integrated resource management (IRM), also known as integrated environmental management (IEM), has been defined by Mitchell (1986: 13) as the "sharing and coordination of values and inputs of a broad range of agencies, policies, publics and other interests when conceiving,

designing and implementing policies, programs or projects". Cairns (1991: 5) further defined IEM as "proactive or preventative measures that maintain the environment in good condition for a variety of long-range sustainable uses". This latter definition incorporates two key concepts a proactive stance, and the concept of sustainability. A proactive stance is important to reduce or eliminate problems before they occur instead of reacting to problems afterwards. Sustainability of resources over the long term is another crucial aim of IRM, as suggested by the Brundtland Commission in the concept of sustainable development (WCED, 1987).

Not all definitions of IRM consider sustainability. Loomis (1993: 8) defined integrated natural resource management as "the process of organizing the different human uses of natural resources in such a way as to produce the greatest value of goods and services from those resources over a given period of time " This is an exploitationist attitude of maximum resource use, with management not necessarily for the long term.

Within Ontario, the Ministry of Natural Resources (OMNR) has defined IRM as "the coordination of resource management programs and activities so that long term benefits are optimized and conflicts between programs are minimized. Benefits are defined by corporately approved program targets and by District Land Use Guidelines" (OMNR, 1988a: 1). This definition has several limitations. First, OMNR refers to the coordination of OMNR activities, not with other management agencies and stakeholders. Second, this definition is strongly anthropocentric, with benefits determined by corporate objectives, with little or no consideration for the natural environment.

For the purpose of this research, IRM is a modified combination of the definitions of Mitchell (1986) and Cairns (1991). Integrated resource management is defined here as the proactive management of the environment through the sharing and coordination of values and

inputs of a broad range of institutional agencies when conceiving, designing and implementing policies, programs, or projects that support a healthy environment for a variety of long-range sustainable uses within a defined environmental system.

The use of an integrated approach for environmental management and planning is advantageous in helping to resolve problems arising from political and administrative boundaries being in variance with ecological boundaries. While these physical geographic boundary problems are important, the institutional boundaries are no less important The shared and fragmented responsibilities of public management agencies both from one level of government to another (federal, provincial, local) or among agencies operating at a common level of government (i.e. water, agriculture, environment, wildlife) also exist (Mitchell and Pigram, 1989). Generally, the increased cooperation and coordination that integration provides leads to a more effective management system. This is the result of integrated resource management facilitating interaction and communication between various agency divisions that overlap, or are sub-units within ecological units. A main obstacle is that "shared and fragmented responsibilities become both a barrier to and rationale for integration" (Mitchell and Pigram, 1989: 197). Fragmentation is a clear rationale for integration, as a fragmented system is inefficient and less effective than a system that is both coordinated and cooperative However, institutional fragmentation is also a barrier to integration, the result of such factors as turf battles between agencies; a political process focused on polarizing issues instead of towards integrated management and mitigation; and specialists being more comfortable working within their own discipline than with specialists in other disciplines (Cairns, 1991 14-17).

A definite need exists for improved planning and management of land and water resources, as the traditional management of these resources occurs independently Planners need to become aware that decisions made about water resources intricately link to decisions and impacts regarding land use (Allayaud, 1979; Falkenmark, 1981, Mitchell and Pigram, 1989). However, McDonald and Kay (1988) state that the integration between resources is still at an embryonic stage The relatively large scale of a watershed area of less than 100 km^2 can result in significant impacts on water resources from land management activities (McDonald and Kay, 1988: 229) Using an integrated approach makes it possible to achieve greater technical and economic efficiency for resource use than occurs with single-purpose management and planning (Sewell, 1965: x).

An integrated resource management approach is at the core of this research. Based on the advantages of this approach, it is suggested that integrated management be used for managing riparian buffer zones. Thus, the research objectives focus upon determining current levels of integration between government agencies, opportunities and constraints for establishing an integrated approach, and to propose an integrated management framework for riparian buffers

2.3 Institutional Arrangements

Numerous factors facilitate or hinder the use of an integrated approach in resource management. One key factor is the current institutional arrangements. The role of institutional arrangements in resource management is critical, as "the disappointing performance of governmental ownership and management of natural resources results from the faulty institutional arrangements within which resource decisions are made" (Johnson 1981: 217).

Fernie and Pitkethly reiterate this idea (1985: preface) by arguing that the success or failure of resource management is dependent upon the institutional structures

The importance of analyzing institutional arrangements in research cannot be over emphasized, as this analysis is "one of the least touched upon, but possibly one of the most fundamental needs in resource management" (O'Riordan, 1971 135) Despite the importance of institutional analysis in resource management, "little consensus has emerged regarding what is meant by 'institutional arrangements'" (Mitchell, 1989. 243)

As a component of public decision making, institutional arrangements involve the linked organization of legal powers, administrative structure and financial provisions (Craine, 1969). Craine (1971: 522) expanded this definition as "a definable system of public decision making, one that includes specific organizational entities and governmental jurisdictions, but transforms conventional emphasis upon definition of agency structure "

Recognizing that the term "institutional" has political and policy implications, Ingram et al. (1984: 323) refined the definition to include "those legal, political and administrative structures and processes through which decisions are made with respect to public policy " These structures and processes consist of formal laws, regulations and mechanisms for conflict resolution, and informal methods for resolving conflict when formal means are inadequate (Ingram et al., 1984: 323).

Institutional analysis is not without problems Ingram et al (1984 324) identify five key barriers to improved institutional anal, .

1. a reluctance to treat institutional factors because they deal with mechanisms by which society allocates scarce values and therefore deal with sensitive subjects involving political conflicts.

2 a perception by agencies that they have no mandate to change or manipulate institutions

3 the premium placed on quantitative analytic procedures while institutional factors are less subject to quantification and arguably less predictable.

4 a tendency to build public support and enhance the agency's position by denying that institutional considerations affect agency decision processes

5 a lack of familiarity with institutional factors among the community of practitioners and scholars who undertake, interpret, and evaluate assessments

All five factors are effective barriers to improved institutional analysis. From a research perspective, the third factor is the greatest barrier. A tendency exists for empirical research that can be supported with quantitative data, while the use of qualitative data is discouraged Institutions and decision-makers are not always quantifiable

Going beyond institutional analysis, Bowen and Gangaware (1988) consider six dimensions to the problem of institutional barriers for environmental protection: legal, political, governmental, cultural, economic, and financial. Within these six dimensions, five factors are provided for each, resulting in thirty institutional barriers to environmental protection. The authors subsequently developed a matrix to evaluate the likelihood of effective environmental plan implementation. Of the various models for institutional evaluation, this model considers political barriers, an often neglected component. Bowen and Gangaware (1988) suggest political support for environmental planning and management is lacking in that environmental protection is often a low priority Results take time, and do not always produce the rapid results desired for political image. Political support for environmental management is critical, because no matter how well the planners advocate or recommend a course of action, the final decision rests with the politicians.

Other problems arise from political barriers. The decision-making hierarchy when upper level governmental decisions regulate lower level activities is problematic as it can occur without consideration or awareness of specific local concerns This results in lower level governmental resistance to implementing the requirements imposed by an upper level of government. Mitigation issues may result by the assignment of functions to the level closest to the people benefiting from the provided functions (Mitchell, 1990 11)

Institutional inadequacies are a widespread phenomenon, as poor land and water management are often a result of "our failure to establish an institutional structure adequate to meet current and future challenges" (Canada - U S. University Seminar, 1973 11) To meet the challenges and deal with existing uncertainty for management and planning exercises, the institutional structure must be flexible, and adaptive to changing circumstances and needs Thus, a dynamic structure is necessary, and the static inflexible arrangements of the past should be abandoned as they are "blocking progress toward the control of environmental degradation as well as the efficient use of resources in general" (Canada-U S University Seminar, 1973 11). The main obstacle to flexibility and adaptiveness is power As Fernie and Pitkethly (1986 preface) note, "resource management is about power and politics To change the status quo, fundamental shifts in the balance of power among vested interests who influence power are required" To achieve a power shift, it is necessary to identify those points at which change can occur.

Institutional arrangements play a critical role in this research If an integrated management framework is to be proposed (research objective five), then the current institutional arrangements must first be identified (research objective one) From this identification, opportunities and constraints to integrated management for riparian buffers must

be determined (research objective four). These arrangements include applicable legislation, policies and guidelines on buffers; the administrative structure needed to deliver required management functions for buffers, and financial arrangements for establishing buffers either by the institution, or by funding private stewardship initiatives.

2.4 Ecosystem Approach

One important feature of the new approach to land use planning in Ontario is the increased recognition of the environment (OMMA, 1993). Important in this recognition is the adoption of an ecosystem approach, which is most evident in the new Natural Heritage, Environmental Protection and Hazard Policies (OMMA, 1994). In simple terms, the ecosystem approach refers to the ecosystem as composed of air, land, water, and living organisms (including humans), and various the interactions among them. Thus, when making decisions, the various interactions and impacts are considered.

Planning on an ecosystem basis is important for several reasons. Initially, there is:

> a growing recognition that unless we regain an awareness of humans as being part of ecosystems, and unless we respond to that awareness by changing the processes and criteria of decision making, we will not be able to improve, and will even lose, the quality of life for which so many generations have laboured (Royal Commission on the Future of the Toronto Waterfront, 1992: 32).

Therefore, it is important that every person is aware that they are not external to the environment, rather an integrated part of it, and to protect the environment is to protect themselves for the long term. Caldwell (1970) states that an ecosystem approach is required "to identify, to protect, and in the interest of human welfare, to manage the natural ecosystems on whose continuing viability human welfare depends" (Caldwell, 1970: 213). Both statements imply a sustainable development philosophy.

Similarly, an ecosystem approach is useful when considering the issue of cumulative effects. These types of effects "should not be seen as a separate or new type of environmental effect, but rather as signifying a better understanding of the relationships between human activities and ecosystems in which they occur" (Davies, 1991: 1) Therefore, planning must recognize that impacts and decisions are interactive with other resources and not limited to one resource Impacts and actions in one location can have repercussions in other areas, and therefore become cumulative over time and space resulting in serious problems such as contaminants entering a watercourse. While levels may not exceed limits locally, additional contaminants to the stream through time and space can create problems. Thus, "The Tragedy of the Commons" results from the overuse and abuse of this common resource (Hardin, 1968) Additional small inputs may not impinge local activities, but to the overall system, the impact can be quite serious.

The idea of planning land uses on an ecosystem basis is not new Caldwell (1970) advocated the use of ecosystem criterion for land policy a quarter of a century ago Caldwell identified several barriers to using an ecosystem approach The first barrier is the ecosystem approach being "inconsistent with the values, assumptions, institutions and practices that shape the prevailing social arrangements which affect the custody and care of the land" (Caldwell, 1970: 204). These conditions must change to make an ecosystem approach effective, and alteration will require considerable effort.

For maximum effectiveness, an ecosystem approach must also consider all lands involved, with both public and private lands being considered equally. This situation is especially contentious as land owners often consider private land rights paramount rights Perceived attempts to infringe upon this right usually results in opposition

The remaining question encompasses the implementation an ecosystem approach. Caldwell (1970) advocated using a comprehensive management approach. By contrast, Vallentyne and Beeton (1988) advocate the use of an integrated approach. The reason for integrated management is that a single resource focus in management, for example water only, is no longer acceptable. Other resources, such as land and air, require consideration for management, such that concerns are addressed in an integrated fashion. While a comprehensive approach is perhaps the best approach, it is in many ways an impractical one because it is impossible to consider all factors and know everything prior to making decisions. A selective process using factors that are most relevant for the situation is perhaps most appropriate. This is especially crucial when using an ecosystem as the basis of management. Our incomplete knowledge of complex ecosystems makes total understanding before planning impractical and impossible.

However, concerns exist over the adoption of an ecosystem approach to planning (Royal Commission on the Future of the Toronto Waterfront, 1992). The main concern is that "although the ecosystem approach to planning could and should be a revolution in planning practice, there is a real danger that it may become instead a descriptive veneer shallowly applied to doing things in the old way" (Royal Commission on the Future of the Toronto Waterfront, 1992, 32). For meaningful change to occur, a break with past practices that created the current problems must take place.

This attitude reflects another major problem in applying an ecosystem approach in that "a major limitation of municipal planning processes is that many ecosystem features and processes - rivers, groundwater, forests, wildlife populations and their migratory patterns, air movement - transcend municipal boundaries" (Royal Commission on the Future of the Toronto

Waterfront, 1991, 70). Again the problem of boundaries surfaces. The original discussion paper states that municipal plans should "adopt policies and designations based on watershed considerations for matters of development and change affecting water; and be coordinated with the plans of adjacent municipalities" (OMMA, 1993, 16) Although the idea remains implicit (OMMA, 1994), the explicit wording was removed from the subsequent implementation policy.

Buffer zones are intricately linked to an ecosystem approach The basic function of a vegetative strip is to use natural ecological processes to filter surface and subsurface water of pollutants before it enters a watercourse. Since ecological processes are being utilized, an ecosystem is the most appropriate planning unit of which the watershed/subwatershed is the preferred unit. However, natural boundaries of ecological units rarely coincide with administrative units. As a result, problems surrounding the conflict between artificial administrative units and natural ecological units. The following research examines these problems in response to the second research objective.

2.5 Watershed Planning

A watershed, also known as a catchment, can be defined as "a topographically delineated area that is drained by a stream system" (Easter and Hufschmidt, 1985). A similar term often used in conjunction with the term watershed is a river basin, although this involves a much larger scale, for example the Mississippi River Basin, or Great Lakes-St. Lawrence River Basin. A watershed can be subdivided into subwatersheds, currently the smallest level considered in Ontario, and the level where detailed planning is undertaken to meet the goals and objectives of a watershed plan.

The idea of planning and managing on a watershed basis is not new. Within a North American context, watershed planning first began formally in the United States in 1914 with the Ohio Conservancy Act. This Act allowed the creation of conservancy districts with powers over many factors of river and stream channels, including the flood prevention reservoirs which prompted the establishment of the Act initially (Mitchell and Shrubsole, 1992). Planning on a river basin scale climaxed with the establishment of the Tennessee Valley Authority (TVA) in 1933 to manage the Tennessee River for navigation, flood control, and hydro electric power. White (1969) noted that while the TVA allowed the undertaking of a combination of multi-purpose projects, comprehensive planning on a river basin scale was never replicated in the United States or in other parts of the world.

In recent years, in Ontario the use of watershed-based planning and management has received increased recognition. As the provincial government embraces the concepts of sustainablity and an ecosystem approach for planning, the watershed is seen as the basic management and planning unit, since the watershed is considered a distinct ecosystem (MOEE and OMNR, 1994c). The preference by the province to conduct land use planning on a watershed basis also emerged explicitly in the initial discussion paper on changes to land use planning in the province (OMMA, 1993), and although implicitly stated, remains part of the new policy statements (OMMA, 1994).

While the watershed is a desirable management unit, the actual detailed planning and management is best left to the subwatershed level through detailed studies of this small geographic area (MOEE and OMNR, 1994a). The subwatershed is where watershed goals and objectives can be implemented, but with site consideration.

Planning on a watershed basis is not without problems. The foremost obstacle is the previous mentioned issue of boundaries Watershed boundaries almost inevitably cross administrative and political boundaries, requiring coordination among these political and administrative units Even a small watershed can be divided among several municipalities Depending upon the size of the watershed, the drainage basin may be divided among countries, as is the case with the Great Lakes Basin.

A second issue concerning boundaries is that while land use planning should be applied on a basis such as a watershed, other types of planning - namely social and economic - do not follow such natural geographic units Hence, these issues - environmental, economic and social - should be integrated and considered for successful buffer planning Isolated planning of these factors has failed in the past, and will continue unless all three factors are recognized in the planning process.

Watershed planning has several applications to this research. First, as noted under the previous section on the ecosystem approach, the watershed is the preferred unit upon which to base ecological planning, of which buffers are a part. Second, watershed planning is one method of integrated planning for ecological resources by bringing together all relevant stakeholders. Third, buffers have emerged as a recommendation from such studies as the Laurel Creek Watershed Study (GRCA, 1992b), and the Hanlon Creek Watershed Study (City of Guelph, 1993). Therefore, as a mechanism for integrated buffer management, watershed planning is examined by the research.

2.6 Stewardship

Stewardship is a broad concept encompassing many elements, and is difficult to define. Hilts (1989) defined stewardship as simply "care of the land". Generally, land stewardship has the following common elements (Reid and Hilts, 1990: 1):

1 it relates to private lands;

2 it relies on cooperative, voluntary participation rather than regulatory powers; and,

3 it often involves partnerships of public and private funding and agencies.

The concept of private stewardship within environmental management must be considered for two reasons. First, much environmental management is undertaken by private landowners on private property. This represents part of the overall management context. Currently, more than 90% of the land in southern Ontario is managed by private individuals (Riley and Mohr, 1994: 64). Secondly, private stewardship will likely remain part of the management context as public agencies have limited resources, and because of the overriding issue of landowner rights on private land.

Private land stewardship is not confined to one specific approach, but consists of many various techniques and options for its implementation. Reid and Hilts (1990) identified twelve levels or steps in private land stewardship, ranging from the least protection to the most protection These are summarized as follows:

Information and Education

An information and education component are key to successful private stewardship. It provides land owners with an initial contact for conservation efforts, and helps them to understand the important assets that their property contains. An informed and educated

property owner is more receptive to conservation measures, such as buffer protection, if aware of the ecological significance of features on the property, and of potential conservation measures that can mitigate problems Information and education can vary from a passive pamphlet, to active contact between a land owner and a conservation agent

Verbal Stewardship Agreements

This type of stewardship agreement, also known as a 'handshake' agreement, is between the landowner and a conservation organization In this type of agreement, the landowner agrees to conserve natural heritage features on the property

Written Stewardship Agreements

These involve a written document signed by a landowner outlining specific conservation details, and usually last for a specific duration Since these are written documents, the stewardship process is more formal than with verbal agreements

Management Agreements

Management agreements are widely used in Ontario and usually remain in effect for a specific time. These arrangements can range from informal agreements with no legal force, to a legally binding contract. Perhaps the most common form of management agreement is when a public agency provides technical and financial assistance for a conservation project in exchange for the land owner providing the required land and agreeing to specified management practices. This is the stewardship approach taken in the recent Permanent Pasture II Program of Agriculture Canada (Graham, 1994).

Leases

Leases involve a simple agreement whereby one party pays another party for the use of a property for a period of time. Conservation leases are of limited use in southern Ontario, but are useful when property purchase, such as on an Indian Reserve, is not possible (Reid and Hilts, 1990: 24). They are often used by land trusts for lands that they own, especially in rural agricultural areas, where agriculture activities can continue, but under specific conditions. This also allows trust land to earn income.

Conservation Easements

By contrast to the United States, the use of conservation easements to protect significant natural features are slowly being recognized in Ontario. A conservation easement protects by restricting the use and management of identified areas of private land through a property specific legal arrangement. In the United States, handbooks have been written to assist land trusts in the establishing easements (Diehl, 1988; Lind, 1991).

Purchase/ Saleback

This process involves the purchase of a property for conservation purposes by a government agency, or a non-government organization (NGO). Desired property features are protected by a variety of means, including easements, protective covenants, or severances, and the property resold. In this latter situation, the property is often severed to retain the significant natural features, and in some cases is given to a land trust. This method is best suited for NGO's because the necessary multiple transactions can become entangled in bureaucratic approval (Reid and Hilts, 1990). However, significant initial financial support is required, and a

soft real estate market provides a risk in losing the capital or the carrying charges if the property cannot be resold quickly.

Creative Development

A version of purchase/saleback, this approach involves development designed to minimize environmental impacts on significant features and ensure an adequate return for the developer. This is also known as planned unit development

Conservation Real Estate

This method, also known as eco-realty, involves encouraging conservation-minded people to buy significant properties when other methods to protect the property is not possible The property can then be protected through protective covenants and easements

Land Trusts

Land Trusts involve groups of individuals that join to work towards conservation initiatives. While Land Trusts are common in Britain and the United States, they have only recently been initiated in Canada. Within Ontario, the best known trust is the recently created Waterfront Regeneration Trust.

Land Designation

Designation refers to official recognition and protection of a feature under existing government statutes. In Ontario, historic buildings and districts can be designated under the Heritage Act, but this Act has not been extended to include natural heritage features

Land Dedication

The highest form of protection under private stewardship options, land dedication is the process in which a landowner dedicates the property for conservation purposes, usually in perpetuity, and usually to the government

The greatest advantage of land stewardship is the positive financial implications in land and environmental protection versus the financial cost of the various implementation strategies. As Harris and Gallagher (1989) note, conservation use does not have to involve property purchase, especially for wildlife corridors, but rather incentives for private land owners to participate in conservation efforts is needed

Stewardship plays a major role in the current institutional conservation arrangements Given the large extent of privately owned property in the Grand River watershed, direct public management is unfeasible, and therefore private stewardship is a necessity. Thus, it is important to consider the role of stewardship in the current institutional context, and as an option in an integrated management framework for riparian buffer zones. Additionally, the level of stewardship that can be achieved directly relates to the level of protection given a buffer (education to land dedication).

2.7 Natural Heritage Landscapes

While the term natural heritage is relatively new, the idea is not. Natural heritage is defined to include "geological features and landforms; associated terrestrial and aquatic ecosystems; their plant species, populations and communities; and sustaining environment" (OMNR, 1992b). While this definition is not specific, the concept has also been defined to

include native plant and animal species, and therefore, the natural system before human interference and introduction of non-native species (OMNR, 1991a)

The concept of natural heritage is seen as a unifying theme for conservation initiatives, and this role has been recommended as an integrating concept for land use planning in Ontario (GCPDR, 1993). The concept is also desirable for the many benefits it provides from social, environmental, and economic viewpoints, including contributing to a healthy and diverse natural environment (OMNR, 1991a)

The crucial reason for protecting or restoring natural heritage in southern Ontario is that little remains of the original natural landscape, as prior to European settlement, virtually all of southern Ontario was covered by woodland. The landscape of southern Ontario has changed dramatically in the past twenty years, especially in the urban areas (Riley and Mohr, 1994). In rural areas, the percentage of woodland on agricultural lands decreased from 12.5% in 1966, to only 5.5% in 1986 (Riley and Mohr, 1994. 1)

To preserve small remnant woodlands, efforts are being taken to expand the land area under natural vegetation. One such means is the creation of linkages and corridors, such as natural stream corridors. The Ministry of Natural Resources (1993) has published a guide for natural channel design, which besides creating these corridors, also provide improved fish habitat within the stream channel. The stream-side vegetation designs effectively create a buffer.

The importance of natural heritage requires responsible management "Natural heritage is a concept that expresses collective and individual roles and responsibilities in relation to biodiversity. As such, it recognizes the role of humans as the critical agents of change who at the same time, are the stewards responsible for their natural heritage and legacy" (Riley and

Mohr, 1994 10) Therefore, the public's responsibility is to manage these resources in a sustainable manner for future generations

Natural heritage landscapes represent the last remaining fragments of the landscape prior to vast clearing for agricultural purposes with the onset of European settlement Riparian areas represent a major part of this natural landscape, as the areas were often spared from clearing because they were too damp for agricultural production. Thus, these riparian areas may contain remnant buffers The purpose of creating new naturalized buffers is to restore a natural buffer that has been removed, and connect these remnants of natural buffers. These natural areas also provide natural wildlife corridors because of the stream, and represent a secondary buffer use However, buffers are often considered within a watershed context, whereas the movement of wildlife is not based upon drainage patterns. Therefore, the natural heritage system incorporates considerations of administrative boundaries being in variance with ecological boundaries, even to the extent of revising planning to an ecological basis such as the watershed

2.8 Conclusions

This chapter has reviewed some of the basic concepts relevant to the current research topic, and the areas that need attention. The literature indicates that an integrated management approach to environmental management is a desirable and realistic objective for overcoming such problems as single sector goals and boundary issues. Currently, boundary problems are perhaps the most prevalent barrier to an integrated approach and better environmental management, as the issue surfaces in almost all the areas of discussion. The literature also identifies barriers to integration and the problems associated with institutional analysis.

Institutional analysis is one of the most important considerations in resources management, but is often ignored. The achievement of an integrated management approach requires the recognition of involved institutions and the role of institutional barriers in the management process. Although in its infancy in Ontario, watershed planning is one approach in achieving planning and management on an ecological basis in order to achieve the desired ecosystem approach. However, the watershed is being adopted by the provincial government for ecosystem management. To carry out the actual management, private stewardship is viewed as one method to undertake conservation initiatives, while minimizing the role of government Finally, the protection and restoration of the natural heritage resources must occur, as little remains of the original stock This is the responsibility of both private and public sectors

Chapter Three

Methodology

3.1 Introduction

The research undertaken in this thesis involves the concept of integrated resource management, and attempts to apply it to a specific management issue - riparian buffer zones, and to a specific study area, the Grand River watershed. To begin the research, a literature review was undertaken in the preceding chapter, dealing with general concepts of resource management relevant to this research, including the need for an integrated approach, and a general survey of institutional arrangements. Discussion also focused upon the concepts of watershed/subwatershed planning, private stewardship, and natural heritage. This chapter will outline the study focus and analytical framework used.

3.2 Study Focus

The focus of this study is the institutional context within the Grand River watershed that either plays - or could play - a role regarding riparian buffers. The Grand River watershed has been selected for several reasons. First, it is one of the oldest rivers in the province in terms of management and has a long history of settlement. Second, the watershed is the largest inland basin in southern Ontario, encompassing a significant spatial area (6,965 km^2) with a population of 670,000 people. Third, the watershed exhibits a wide range of situations for buffers, from urban to rural land uses, and two major ecological zones (Carolinian and Alleghenian forest zones).

To present the municipal perspective, two case studies were chosen. Case studies were undertaken given the scope and time limitations of the research, and the scale of the watershed that includes eleven upper-tier and fifty-five lower-tier municipalities. Of the upper tier municipalities, the Regional Municipality of Waterloo and the County of Oxford (with constituent municipalities) were chosen.

The Regional Municipality of Waterloo was chosen because it is the only upper tier municipality completely within the watershed and therefore not influenced by boundary problems Second, the Region is centrally located in the watershed. Third, the Region contains a large population, and has urban and rural land uses. Fourth, the Region of Waterloo has a two-tier planning system with policy developed by the upper tier and implemented by the lower tier. Fifth, the Region has a new Regional Official Policies Plan (ROPP) incorporating the new provincial land use policy statements.

The second case study, the County of Oxford, was chosen for several reasons. First, the County lies partially within the watershed, and as such, is similar to many of the municipalities in the watershed. Second, it adjoins the Region of Waterloo with one of the major tributaries of the Grand River (the Nith River) connecting them, thereby facilitating discussion of municipal interactions. Third, Oxford uses a one-tier planning system that allows a contrast to the Region of Waterloo. Fourth, the County is in the process of creating a new Official plan that, like Waterloo, incorporates the new provincial land use policy statements, and specifically mentions buffers.

3.3 Data Collection

Several methods of data collection were utilized, with the primary methods being interviews, and statute and document review (Appendix C). Interviews were conducted between September 1994 and August 1995. Participants were asked to sign a consent form for participation in the interview. This allowed the participants to withdraw participation at any time in the research process. Furthermore, the consent form specifically determined if the use of a cassette recorder was acceptable during the interview; if they approved of their name appearing in the final report; and approval of being cited in the final report.

Interviews were conducted with key individuals of governmental agencies. The provincial agencies that were contacted were the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), the Ontario Ministry of the Environment and Energy (MOEE), the Ontario Ministry of Natural Resources (OMNR), and the Grand River Conservation Authority (GRCA). These are identified in Table 3.1.

Table 3.1 Provincial Agency Interviews

GRCA	Wayne MacMillan	Assistant Manager, Environmental Services Group
	Lorrie Minshall	Manager of Watershed Resources Planning
	Charlie Roland	Soil Conservation Technician
	Christine Shantz	Environmental Technician
	Ralph Beaumont	Manager of Communications
OMAFRA	Ted Taylor	Resources and Regulations Branch
	Peter Roberts	Resource Management Specialist, Resources and Regulations Branch
	Harvey Wright	Soil and Crop Advisor, Waterloo Field Office
OMNR	Dave Cooper	Senior Planner, Cambridge District
	Kevin Loftus	Aquatic Ecosystems Branch
	Art Timmerman	District Biologist, Cambridge District

For the GRCA, MacMillan was contacted due to his extensive experience dealing with buffers for the Authority. Additionally, MacMillan worked on creating the three zone buffer model that the GRCA proposed in its 1991 wetlands management document. Minshall was

used because she now heads the divisions dealing with buffers and is in a position to comment on linkages with other agencies. Roland is utilized as he is currently running the Beaver Creek Demonstration Project that attempts to apply a variety of extension services and initiatives to an agricultural watershed, including buffer zones. Shantz is used as she works on the administration of the MOEE CURB program (which partially considers buffers) that the GRCA administers locally for the MOEE. Lastly, Beaumont is contacted to provide general comments on the Authority structure and linkages that exist, especially to municipalities

For OMAFRA, Taylor and Roberts were contacted since they are editors of the Best Management Practices booklet series for the ministry, which includes buffers as a BMP Roberts was also contacted because he was referred within the ministry, and because of the work he is currently pursuing is related to buffers. Wright was contacted because he is the Soil and Crop Advisor for the Waterloo Field Office through which administrative level environmental extension services are delivered to the public.

At the OMNR, Loftus was used to represent the upper ministry levels at which buffers are considered, and Loftus has also been working on the guidelines for the revised provincial policy statements concerning wetlands (and buffers). Cooper and Timmerman were contacted as local representatives who deal with buffers in an implementation and review process, and who collaborate local interactions. A representative from the OMNR Southern Region Office, noted for working on buffers, did not respond despite numerous attempts at contact

All of the above individuals were identified through a review of the administrative structure, and relevant documents (Appendix C), consultation with noted individuals and interview referrals (a snowball approach). Letters and questionnaires were sent to provincial ministry offices concerning the Environmental Bill of Rights (one OMMA, one OMAFRA, one

OMNR, one MOEE) to determine their attitudes towards integration, and potential methods of achieving integration. The agents' attitudes and perceptions towards riparian buffers, and views on opportunities and constraints to integration were also probed. The broader agency or ministry perspective which included the mandates, applicable statutes, and regional and head office perspectives, was established through a document search.

At the municipal level, interviews were used in the two case studies in order to explore the new role municipalities play in land use planning in Ontario, and for buffers. Within the Regional Municipality of Waterloo, eight individuals were contacted - one from each of the constituent municipal components in the two-tier system. In the centralized planning format of the County of Oxford, the Director of Planning (who deals with environmental issues) was contacted. These individuals are identified in Table 3.2. The person interviewed was either the senior planner, or had considerable experience with buffers for the municipality. In this respect, the contact may also be the only planner for the municipality. The only exception was Sleeth who as a landscape architect, provided a local perspective from a view other than that of a planner. Sleeth has also dealt with buffers through the Parks and Recreation Department of the City of Kitchener.

Table 3.2 Municipal Interviews

Region of Waterloo	Chris Gosselin	Manager, Environmental Planning, Region of Waterloo
	April Ionson	Senior Environmental Planner, City of Cambridge.
	William Sleeth	Landscape Architect, City of Kitchener.
	Brian Trushinski	Senior Planner, City of Waterloo.
	Amedeo Spagnuolo	Director of Planning, Township of North Dumfries.
	Susan Duke	Director of Administration and Planning, Township of Wellesley.
	Barb Dembek	Director of Planning, Township of Wilmot.
	Dave Gosnay	Director of Planning, Township of Woolwich.
County of Oxford	Craig Manley	Director of Planning, County of Oxford.

A representative from the Ontario Soil and Crop Improvement Association (who has been involved in buffer implementation programs) was contacted to provide a non-governmental perspective of buffer zone as a cross check of the data provided by the government agents and government documents concerning buffers. A broad scale sample of land owners was not conducted because it would require a large sample across the watershed to provide a suitable response, which was beyond the scope of the thesis However, one land owner who has undertaken a large scale riparian conservation initiative was contacted to provide a view of institutional problems experienced.

Individuals who might have been contacted, such as academics, consultants, and higher level governmental officials, were not pursued for several reasons First, the focus of academics has been upon buffers as nutrient and sediment sinks, with attempts to quantify this result. This research, mainly done in the United States, is not directly relevant to this research, and thus was not pursued. Buffers have for the most part been ignored in Canadian academic research. However, some academics have considered subjects related to buffers including greenways, corridors, and linkages. While these features may be part of a multi-functional buffer, but cannot be considered synonymous with a buffer Second, consultants were not contacted because they work closely with the development industry. Development (land owners) are not the focus of this research, and consultants often reflect the views and perspectives of developers. Third, higher levels in the government, such as inquiries to Queen's Park, were not pursued due to problems obtaining information from the information sections of the various ministries contacted. Additionally, in some cases direction was given to lower levels in a ministry. For example, the contact with Peter Roberts at OMAFRA resulted

from initial questions contained within the letter sent regarding the EBR that were subsequently passed down through the ministry for Roberts to answer.

3.4 Analytical Framework

Several approaches to analyze the institutional arrangements could be used. In analyzing the institutional arrangements for coastal conservation in New Zealand, Gardner (1984) used an issue approach. Through five case studies, Gardner described the broad context and analyzed an issue involving conservation goals and ideals and related these to institutional arrangements. Policies and institutional arrangements were then evaluated based upon the issue analysis. This model considered an issue from areas where different coastal conservation was attempted. While a potential model, it is not used since the issue context used by Gardener compares areas, not agencies operating within a common area.

Another approach was taken by Kelley et al (1976) to compare specific environmental problems in Japan, the USSR, and the USA in a broad cultural, historical, political and economic context with the state as the focus. Although the model uses a broad context to explore the problems and policies which is useful for this research, it does not consider a regional view, nor does it fully consider other aspects of the institutional arrangements, such as structure and functions. Additionally, my research is aimed at comparisons within a common area and context, not an international comparison.

Lundqvist (1974) considered the character and distribution of values, control of the government and the behaviour of participants in his institutional analysis of environmental policies in Canada, Sweden, and the United States. Based upon the five criteria of the model, Lundqvist undertakes the analysis in an attitude and perception mode, and with a policy focus.

While attitudes and policy are applicable for this research, they are not the only factors requiring consideration as other management factors deserve attention

To facilitate the analysis of this study, the analytical framework devised by Mitchell in 1987 and subsequently updated in 1990 (Mitchell, 1987, 1990) is used This model was chosen because it expands upon the previous models discussed and is best suited to achieving the five study objectives. The framework is concerned with "the provision of institutional arrangements that provide for coordination and an integrated approach to resource management" (Smith, 1993: 37). Smith notes the framework makes three assumptions (Smith, 1993: 37). First, public sector responsibilities for resource management are fragmented and shared by several different management agencies Second, as a result of fragmentation, boundary problems arise among managing agencies regarding overlapping jurisdictions and multiple mandates. Third, to achieve integrated resource management, institutional arrangements must address the above problems.

Mitchell (1990: 7) suggested this framework can be used in a descriptive and/or prescriptive mode. In the descriptive mode, the framework concentrates upon key events, decisions and people in a resource management situation. In the prescriptive mode, the framework guidelines provide a direction for possible changes or modifications to the management situation. This research operates mainly in the descriptive mode

The framework consists of six components· context, legitimization, functions, structures, processes and mechanisms, and organizational culture and attitudes. Within a given context, the remaining five components are leverage points through which to cause change and opportunities for integration (Mitchell, 1990: 17)

A. Context

To assess the opportunities for the integration of land and water resource management, it is necessary to have a firm understanding of four key elements of the broad contextual situation in which the management framework operates. First, it is necessary to comprehend the state of the natural environment to recognize if issues or problems related to natural systems are responsible for prompting action. The primary function of riparian buffers as a means to improve water quality in watercourses indicates that the natural environment is the impetus for action. Second, prevailing agency and decision making ideologies must be identified, as these influence management goals, objectives or strategies. Third, predominant economic conditions require attention, as these influence the willingness to undertake new ventures. In difficult economic times, governments are less likely to undertake new ventures. In these current times of high government deficits and cuts to government spending, integration is one means of more efficiently utilizing staff and eliminating duplication, especially in response to agency budgetary and staff cuts. Fourth, the existing legal, administrative, and financial arrangements at provincial and municipal governmental levels require attention. The combination of these four factors provides the contextual framework for the following factors. The context is important because it is within the context that the other components of the analytical framework operate and affect the basis of institutional arrangements. In this study, the context includes a revised land use planning system with reduced provincial involvement, reduced government funding with program and staff cutbacks, and water quality concerns, with buffers as a low cost BMP

B. Legitimation

The legitimation component of the framework is the core to institutional analysis It establishes the responsibility, power and authority of the relevant agencies undertaking environmental management. This component includes the mandates, roles and objectives of the various institutions involved in the decision-making and management system, and the various statutes and regulations that an institution may be assigned to administer The legitimation component also establishes rules for intervention by higher level authorities in dispute resolution, and helps govern activities and relationships among agencies Legitimation can occur through a variety of methods, including political commitment, statute, administrative policy, or financial support. The financial component is increasingly essential for undertaking new initiatives, establishing program credibility, and increasing the chances of program success However, in times of financial restraint and cut-backs, the financial component is usually the first to suffer. The legitimation component is important because it establishes the mandates, role, and statutes of the various managing agencies for buffers, and identifies the financial considerations for buffers.

C. Functions

Management functions play a pivotal role through explicit linkages to both the legitimation and structure components. While the legitimation component establishes the appropriate functions for management, the structure determines the organizational hierarchy (national, provincial, regional, local) that the functions are assigned for delivery Mitchell (1990: 10-11) recommended assigning functions to the level of government closest to the people receiving the service or product.

Functions can be divided into two categories: generic and substantive. Generic functions are not specific to any particular resource sector and deal with (1) data collection, (2) planning, (3) regulation, (4) development, (5) monitoring, and (6) enforcement. In contrast, substantive functions are specific to a particular resource or sector. In the management of the land and water interface in the riparian zone, functions include but are not limited to (1) floodplain management, (2) erosion control, (3) drainage, and (4) wetlands. These four substantive functions are served by buffer zones. Functions are important because they partly reflect the current institutional arrangements for buffers.

D. Structures

The term structures refers to the organizational structure through which management functions are delivered. This can range from a structure involving a few, large, centralized, and multi-function agencies, to a structure involving many small, decentralized and specialized agencies. These examples reflect extremes on a continuum, as the actual structure may lie between these extremes, or could include aspects of each.

The organizational structure design should consider several important issues. First, the structure should be efficient. The design should avoid unnecessary duplication of management functions, while possessing adequate financial and technical resources. The financial and technical factors can be enhanced by using economies of scale. However, too large a structure can lead to an inefficient bureaucratic quagmire. Second, there must be accountability of both the organization and government in policy making. This can be addressed through processes and mechanisms such as public participation and roundtables. A third consideration is flexibility. A structure should be able to adapt to changing conditions and uncertainty. An

inflexible structure unable to respond to change is inefficient, ineffective, and dangerous if unable to deliver critical functions at a needed time. The structure also should be effective If the organization or agency cannot deliver functions effectively, not only may the structure be questioned, but so will the actual need for the organization or agency An ineffective structure is also usually inefficient and financially wasteful. Lastly, the structure should provide for both equity and fairness. In this respect, the structure should be sensitive to an individual's or sub-group's needs or issues, while maintaining objectivity so that the needs of the community as a whole is not lost. Thus, a balance is required. The structure is important because it reflects the delivery of the management functions, and reveals potential opportunities and constraints for an efficient and integrated management approach.

E. Processes and Mechanisms

Despite the best attempts of decision makers to create an effective framework, it is necessary to have processes and mechanisms to facilitate negotiation and mediation Processes and mechanisms establish links between management agencies, facilitate interaction, and establish some opportunities and constraints to integration As such, many different types of processes and mechanisms exist, occurring essentially in two forms: political and bureaucratic Political processes involve the political framework and representatives, with the two main processes being inter-ministerial councils, and select committees The main forms of bureaucratic processes and mechanism are interdepartmental committees and commissions

Processes commonly utilized are task forces, public participation, environmental impact assessments, and review procedures. Task forces usually have a specific purpose and operate within a specific period. Public participation involves the public through committees, meetings

or other forms of input EIA involves all parties for a specific government funded project, and review procedures often involve plan and proposal circulation to related agencies for comment

F. Organizational Culture and Attitudes

Ultimately, the success or failure of a management system is the result of the attitudes of the participants involved Participants inclined to achieve an integrated, coordinated or cooperative management framework can succeed even with a poor or flawed management framework Conversely, negative attitudes can cause well-designed frameworks to fail Therefore, attitudes reflecting agency willingness to undertake buffer initiatives, and to coordinate and interact on buffers, must be considered

From an organizational viewpoint, traditionally there has been little incentive to pursue integration among agencies As Frost et al (1985) note, the organizational culture usually promotes public agencies to consider their interests ahead of those of the public This is attributable to the agency attempting to accumulate as much power as possible for its own "fiefdom" at the expense of other ministries and agencies. Integration is viewed with suspicion as a power loss for that agency, and often is minimized or avoided.

Similarly, the role of individuals is important. Often the personalities and attitudes of the individuals affect the outcome of the decision-making process. If an individual involved in a key position does not favour integration or coordination, efforts to achieve this goal can be blocked As well, if personality conflicts arise between key individuals in two or more agencies, integration efforts can be effectively damaged and are not likely to improve until the personal relationship improves, or the individuals are replaced. O'Riordan (1976 65) observed that decision making in resource management often has more to do with the determination,

vision, indifference, antagonisms and bloody-mindedness of individuals in power positions than with organization, statutes, and coordination arrangements.

All of these factors - organizational culture, participant attitudes, and personalities, conspire against an integrated and coordinated management system These factors cannot be ignored when considering institutional arrangements As Mitchell (1990a) comments, "organizational culture and attitudes are reality."

3.5 Analysis

The aim of the analysis is to develop an integrated management approach for riparian buffers, given the current concepts and context of land use planning in Ontario and with specific reference to the Grand River watershed This will be developed from a variety of sources, including literature review and interviews

The literature review provides the basis for the need for integration of institutional arrangements, the concept of watershed planning, and the rationale of buffer zones, including a review of scientific analysis of the use of buffers as land use mitigation measures to protect designated features. The review also involves agency documents, policies and statutes that exist for various agencies and affecting the resource management situation A main data collection method for this research involved interviews with selected people in appropriate government agencies at the provincial and municipal levels, and other selected individuals The interview questions target key issues of the analytical framework

As a result of the interview selection process and the open-ended, qualitative questions, statistical analysis is not used. Given the relatively small number of respondents, the use of

even basic statistics, such as percentages, would have little meaning. Thus, the main research thrust is qualitative interpretation of the interviews in conjunction with relevant literature.

Chapter Four

Buffers

4.1 Introduction

The term 'buffer' is used in many areas of academic research, from chemistry and political science to landscape ecology In the area of political science, a buffer refers to a country located between two conflicting nations that serves to reduce the impacts that would occur if the conflicting nations were in direct contact. In environmental management, buffers serve much the same role by reducing impacts between two adjoining, yet conflicting land uses

Traditionally, buffers have been used to protect aquatic systems (wetlands, streams, and shorelines) from activities occurring in upland terrestrial areas by improving water quality This is accomplished by filtering out water-borne contaminants before overland and subterranean flow enters a water body. However, the past decade has also seen buffers promoted for terrestrial features. The focus of this research is buffers in the riparian zone for the primary function of water quality improvement The riparian zone refers to the transition area between terrestrial and aquatic systems (i.e. along river, stream, lake, or wetland)

4.2 Definition

Within landscape ecology and environmental management, the term "buffer" is used in several different contexts. A generic definition for a buffer is "areas adjacent to protected areas on which land use is partially restricted to give an added layer of protection to the protected area itself while providing valued benefits to neighbouring rural communities" (Mackinnon et

al., 1986) While used in the context of tropical rainforests, this definition is also valid for temperate climates and urban communities.

For terrestrial features, buffers are advocated for sensitive areas, especially parks In this context, buffer definitions range from the vague "areas outside of parks that are designed to protect parks" (Wind and Prins, 1989), to the detailed, "a zone, peripheral to a national park or an equivalent reserve, where restrictions upon resource use or special development measures are undertaken to enhance the conservation value of the area" (Sayer, 1991). These buffers should be incorporated into an overall strategy with riparian buffers.

The definition for buffer strips is modified to reflect the aquatic aspect of the riparian zone, and in some cases, to reflect the adjacent land use. In Ontario, the Ministry of Natural Resources (OMNR) has defined a vegetative buffer zone as "a permanent setback established along the shoreline or stream bank which remains or is to be returned to a self sustaining vegetated state" (OMNR, 1987: 1). The primary emphasis of the OMNR is the protection of fish habitat, and hence this definition stresses buffer establishment in the riparian zone, and also differs from other definitions by stressing that the zone is permanently vegetated. Buffer vegetation is to be retained or re-established to provide a natural buffer, in contrast to an artificial, structurally engineered buffer. This definition also states the buffer should be self sustaining, a term that may raise management conflicts. Muscutt (1993: 59) defined a buffer as "a permanently vegetated area of land which is separately managed from the rest of a field or catchment." In this sense, buffer vegetation is not just self maintaining, but is managed.

Within an agricultural context, a buffer can be defined as "bands of planted or indigenous vegetation situated downslope of cropland or animal production facilities to provide localized erosion protection and filter nutrients, sediment and other pollutants from agricultural

runoff before reaching receiving waters" (Dillaha et al., 1989) This definition links terrestrial and aquatic definitions of buffers. These planted vegetation bands provide a protection factor, but are not specifically located within the riparian zone.

4.3 Buffer Uses

The use of riparian buffers has been considered for many aspects of land management, including forestry, agriculture, and development. Additionally, the traditional view of buffers serving a single purpose (water quality improvement) is also changing as the multiple uses and benefits of buffers are recognized (Table 4.1).

Table 4.1 Buffer Use Options

Option	Positive	Negative
Water Quality	* primary buffer function * reduction in pollutants	* traditional single use * composition can dictate single use
Recreation	* land used for passive recreation * parkland in urban areas	* contentious issue in rural areas * takes land away from active uses
Windbreak	* added benefit for buffer	* requires trees for maximum effect * tree root problems
Agroforestry	* revenue generating * buffer not viewed as wasted land	* long time to get a return * requires larger initial investment * financial return may be less in a buffer * may have increased maintenance costs
Erosion	* benefit of shore or bank vegetation * reduced sediment and sediment-bound nutrients	* requires dense undercover * sheet flow required
Wildlife	* riparian areas are natural corridors * vegetation provides good habitat	* animals may be a nuisance to agriculture * requires a wider buffer

Source: Author

Forestry

In forestry, North American buffer discussion dates to the 1950's with the consideration of how far from a stream a logging road should be located (Trimble and Sartz, 1957) This early research discovered a direct correlation between the terrain slope (between the road and the stream) and the necessary buffer width. Therefore, Trimble and Sartz developed a rule of thumb for determining buffer width: an initial twenty-five foot (7.62 m) wide strip on level land that increases two feet (0.61 m) for every one percent increase in terrain slope In areas where water quality is of high importance, these figures are doubled.

While this design shows an ever increasing buffer based on slope, Aubertin and Patric (1974) concluded that a ten to twenty metre buffer was adequate to control major chemical and nutrient discharge in a West Virginia logged watershed. Haupt and Kidd (1965) further concluded that 3.54 m buffers should be the minimum used, with 10.62 m buffers preferable for logging operations in central Idaho.

The Province of New Brunswick has viewed the role of buffers in forestry for many years, primarily for forestry activities on Crown Land (New Brunswick, 1994). The location, widths and objectives of these buffers are approved by the Department of Natural Resources, and buffers are located on all streams more than a half metre wide (New Brunswick, 1994). Generally, roads on Crown Land are prohibited within thirty metres of a stream, and regardless of the stream dimension, ten metres is the minimum restricted distance (New Brunswick, 1994) In addition, the economic viability and environmental impact of timber harvesting from buffer strips have been reviewed (Moore and Henley, 1984). The study concluded that timber removal can be accomplished in a manner that is environmentally sound and economically viable for the forestry operator. The recommended widths for buffers are fifteen metres for a

zero to five percent slope; thirty metres for a five to ten percent slope, and sixty metres for slopes over ten percent

In Ontario, the Ministry of Natural Resources (OMNR, 1988b) has also adopted a setback for logging based upon slope. The base buffer width is thirty metres for terrain with a zero to fifteen percent slope, and reaches a maximum of ninety metres for terrain with a forty-six to sixty percent slope.

Agriculture

There is an ongoing interest in using buffers to mitigate the impacts of intensive agricultural practices. As a result, many studies have been undertaken to determine the nutrient and sediment retention and capture ability of buffer zones within a rural agricultural setting. Many of these studies are summarized in Section 4.6 on the effectiveness of buffers, and a good additional review is provided by Lammers-Helps and Robinson (1991). Generally smaller buffers in the rural agricultural landscape are recommended compared to other land uses. The primary justification for this decision is that within the farming community, the removal of significant areas of land from agricultural production can result in decreased economic viability for farming operations. A secondary reason may be the traditional power role that agriculture has played in many cultures, and still retains this power position despite urban political domination.

Buffers zones can be utilized for a wide variety of uses. The Ontario Ministry of Agriculture and Food (OMAF) has identified numerous advantages of buffer strips in a rural setting (OMAF, 1993). These advantages include improved water quality by trapping eroding sediment and nutrients, thereby decreasing stream sedimentation and oxygen depleting algae

growth Riparian buffers also keep livestock and machinery away from the streambank, helping to protect bank stability from erosion, and if heavily vegetated, to assist in temperature moderation of the watercourse. These primary functions assist the secondary uses, including improved fish and wildlife habitat and the provision of wildlife corridors. The nutrients captured are also beneficial for tree growth.

For agriculture, treed buffers are also being appreciated for another role. Long considered for water erosion protection, a vegetative buffer can also provide wind erosion protection If properly designed, bare stream corridors could be re-vegetated to create a treed buffer that also provides a wind break, as suggested by Taylor (1994).

Interest in a multi-functional buffer, such as wildlife corridors and cold-water fisheries, is secondary for the agricultural community. Vegetation in these zones has the potential to function as wind breaks, or to provide a revenue source through agroforestry activities (OMAF, 1993) However, the major limitation of income generating secondary uses is the time required to return the initial investment. As well, concerns exist that these vegetative corridors may harbour nuisance animals that can destroy adjacent crops (Burtt, 1994). Linked to this is a concern of weed domination before firm buffer establishment, and weeds spreading to adjacent properties (Burtt, 1994). This issue is especially problematic if naturalization is desired.

Research has still not fully considered the role of buffers regarding water quality improvements in the agricultural context. Further research is required to determine the ability of the buffer to capture pesticide residue and pathogens from manure (Lammers-Helps and Robinson, 1991). Additionally, the overall ability of a vegetative buffer to function during winter when the vegetation is dormant must be more closely studied.

Potential secondary uses inevitably raise concerns for rural communities. As the functional role of the buffer expands to provide additional benefits, the burden of the disadvantages to the property owner also increases. As noted by Dave Gosnay (Director of Planning, Woolwich Township), if the community desires the creation of wildlife corridors, then the buffer width must be enlarged and should contain more vegetation (Gosnay, 1995). The issue then is why the property owner should bear this burden when there is no direct benefit. A real concern also is that as secondary uses are loaded on a buffer, the buffer becomes a tougher sell to land owners. While a land owner may desire a buffer for water quality improvement and/or erosion control, the real or perceived disadvantages of additional secondary uses may result in no buffer being implemented.

Intricately linked to potential buffer uses is the issue of land owner rights. The general preference of rural planners interviewed is for no required specific plantings for buffer composition, such as a naturalized buffer over a grassed buffer. The justification from Barb Dembek (Director of Planning, Wilmot Township) is that these buffers are on private land and should be respected as such. Additionally, land use planning regulates land use, not land activities. However, individuality can create problems for developing a common strategy for the buffer within a watershed. If the desired goal is a naturalized buffer, including the reintroduction of Carolinian species in the Carolinian Zone (middle to lower portions of the Grand River watershed), such an objective is difficult to achieve if specific plantings are not required. While the general idea of a buffer may be accepted by a majority of land owners, some will ultimately choose species with recognized characteristics, such as superior nutrient uptake or rapid establishment. These species may be non-native, invasive, and counter-productive for establishing native species. Hence, diverse planting material can obstruct a

desired objective. This problem can occur for fisheries improvement if some land owners opt for grass rather than a treed buffer.

Property rights are also a common issue Rural planners are normally against programs making specific use of a property a requirement. The choice should be voluntary, with adequate incentives provided for implementing buffers so that financial burdens of buffers do not outweigh benefits. Again, financial burden is a key consideration. Susan Duke (Director of Administration and Planning, Township of Wellesley) questions the viability of narrow stream-side corridor strips of land for alternative crops, such as agroforestry. If a farmer growing corn decides to create a thirty metre buffer occupying two to three acres of land, trees will not be planted because the area is not large enough to make them economically viable (Duke, 1994) An agricultural land owner is operating a business, and Duke doubts added investment in a buffer will occur if there is no viable return. While agroforestry is possible, such as maple trees for maple syrup production, investment return will not likely occur within that particular land owner's life time (Duke, 1994) Additionally, the maintenance cost for agroforestry may be more, as care must be given to the trees to protect and ensure survival.

Land owner rights become heightened with the use of buffers for recreational purposes. The feelings expressed by the planners and the legal view is that if these lands are privately owned, then the public has no right to trespass Access should only occur if an easement or other form of right of access is granted and/or public access is deemed acceptable, and with landowner cooperation. Recreational concerns are usually the result of the buffers being considered as potential trail locations.

The major irritant for rural municipalities is that they are considered urban playgrounds while no support (financial or otherwise) is given from the urban centres to the rural

municipalities for these recreational activities. When the Regional Municipality of Waterloo was revising its Regional Official Policies Plan (ROPP), initial discussions occurred concerning the potential creation of a greenbelt around Cambridge, Kitchener, and Waterloo Such a concept was supported in principle, but from different perspectives Rural expectations of Woolwich Township and Director of Planning, Dave Gosnay, were for an agricultural greenbelt to designate and preserve this area as farming, and other uses, such as urban recreation, kept out of the area. Conversely, urban desires were for a rural greenbelt for urban recreation purposes. Such recreational activity creates a host of problems for a rural municipality according to Duke, including the limited resources to deal with these types of recreational activities, and the issue of sterilizing the land with an artificial designation, raising again the issue of compensation (Duke, 1994) This sterilization refers to the area being designated as a greenbelt, reducing agricultural viability as the land becomes more valuable to speculation. The attitude of Gosnay is that if urban municipalities desire greenbelts and open areas, adequate space remains within urban boundaries to plan and incorporate them (Gosnay, 1994).

Urban Development/ Restoration

Urban land use, specifically the development process, has the potential to create significant negative impacts upon sensitive riparian areas During construction, the clearing of developable land increases the susceptibility of soil erosion with detrimental impacts on adjacent streams. To mitigate these impacts, several methods are often used, including sediment fences and buffer strips. In eastern Connecticut, a thirty-metre buffer strip based upon soil type and site slope was used to protect the riparian zone from suburban development

(Murphy and Phillips, 1989) Buffers were also utilized in Minneapolis for a golf course development by placing twenty-foot buffers along trails and edges, and setting greens back from wetland edges by at least fifty feet (Schreiner, 1989). Other states, such as Colorado, have increased protection of urban stream corridors. In 1974, the city of Fort Collins, Colorado began to preserve riparian areas through innovative long-range planning (Horak, 1989). Boulder, Colorado followed in 1985 by adopting the Boulder Creek Corridor Project aimed at providing recreational opportunities, while preserving and enhancing wildlife habitat, and improving flood carrying capacity of the stream (Windell et al., 1988). California adopted a similar program the same year to reduce streambank instability and flooding, while restoring and enhancing the riparian landscape, including aesthetics, recreation, and fish and wildlife habitat (Riley, 1988). A brief overview of urban stream reclamation techniques is provided by Ferguson (1991)

In urban areas, multiple use buffers are not as contentious as in rural areas. The primary purpose is to mitigate potential land use impacts adjacent to that land, such as surface storm water coming from properties, or in communities not using storm water management, to absorb contaminants before entering sensitive areas, habitats or food sources (Trushinski, 1995) This mitigation protects the significant ecological form and functions existing along an edge of a woodland or wetland behind the edge, and is a function of species and groundwater. These buffers are necessary if the edge has been degraded or is in a state of decline, since the buffer aids restoration through natural succession or assisted plantings.

A primary function of the urban buffer is to protect a core feature from human degradation. In an urban setting, natural woodlands, wetlands or natural areas will ultimately be used for active or passive recreational purposes, regardless if officially permitted by the

municipality. If it is agreed that public use of these areas is permitted, then the urban municipality is responsible to ensure that the use is not detrimental to the core feature Thus, trail networks should be designed in an informative and educational manner, and constructed so that the materials and physical location do not negatively impact sensitive features In some cases, a trail within the buffer will reduce public desirability to enter the core protected area This trail could also play a role as a utility corridor for buried cables, providing such installation does not alter the form and function of the ecosystem However, in riparian areas, utility trenches parallel to watercourses can disturb the natural hydrologic regime by creating a French Drain. Thus, the use of a buffer for a utility corridor is dependent on soil type and groundwater regime.

4.4 Buffer Functions

Buffers have traditionally been viewed as uni-functional, serving the single purpose of improving water quality. Despite this important function, buffers are increasingly recognized for the multi-functional roles they can provide Additional roles include streambank erosion protection, stream shading and water temperature control for aquatic habitat, wildlife habitat, and as a connecting corridor for flora and fauna

Research in the past has focused on buffers for the retention of sediment and nutrients OMAF (1993) states that the advantages of nutrient capture are improved tree growth from the added nutrients, and reduced algae growth in the streams or wetlands that deplete oxygen in the water. This also improves water quality for fish habitat, as reduced algae improves the dissolved oxygen content in the water In addition, if tree and shrub vegetation are utilized for buffer composition, the buffer provides the additional benefit of stream shading (Steinblums et

al 1984 Brazier and Brown, 1973) Stream shading provides temperature regulation by shading the stream during summer and thus cooler, allowing the water to contain higher levels of dissolved oxygen This natural vegetation on the stream bank also forms the basis of a natural stream channel and consequently a natural food chain for the stream (OMNR, 1993)

4.5 Buffer Dimensions

Considerable research on buffer zones has provided recommended widths and setbacks in various situations (Tables 4 2 and 4.3) Despite this volume of buffer zone research, no definitive width has been agreed upon for buffers. While buffer width should consider the functional role of the buffer, the factors influencing effectiveness, and the buffer design model, most buffers or setbacks are a fixed width. As such, there has been little consideration for a common or standard setback for buffers.

A direct correlation exists between the slope of the terrain and the necessary buffer width (Trimble and Sartz, 1957; OMNR, 1988b). This is due to the fact that buffer effectiveness increases with width (Newbold et al., 1980). Nonetheless, an ever increasing buffer strip can be considered excessive. Generally, many recommended buffers range from fifteen to thirty metres in width, and are considered to provide adequate protection in most circumstances In the United States, numerous wetland protection statutes at the state level require buffers in this range (Table 4.3).

In Canada, an emergence of a wide range of setbacks has occurred. At the federal level, the Environmental Code of Good Practice for Highways and Railways, and the Environmental Code of Good Practice for General Construction (Environment Canada, 1979; 1980), detail recommended setbacks for activities near waterbodies (Table 4.2). In most

Table 4.2 Setbacks and buffer width recommended by agencies and authors in Canada in various situations

AGENCY OR AUTHOR	SITUATION		SETBACK
OMNR (1987)	1 Warmwater Streams (no defined valley)		15 m minimum from streambank
	2 Coldwater Streams (no defined valley)		30 m minimum from streambank
	3. Steep Slopes within above buffer		Add 9 m from top of bank at steep slope areas
	4. Well defined wetland vegetation		15 m minmum from vegetation edge
	5. Sensitive soil conditions around streams (i e thin soils over bedrock, extensive organics)		30 m minimum from streambank
OMNR (1988)	Slope (%)	Slope Angle (o)	
	0-15	0-8	30 m
	16-30	9-17	50 m
	31-45	18-24	70 m
	46-60	25-31	90 m
OMMA (1994) Natural Heritage, Environmental Protection, & Hazard Policies	Adjacent Lands Definition		within 120 m of a wetland, EIS required
OMAF (1993)	general		3 m minimum
GRCA (1991) discussion paper	wetland buffer strip - 3 zone model		50 m minimum
	1 Preservation Zone		20 m
	2 Buffer Development or Enhancement Zone		20 m
	3 Development Control Zone		10 m
GRCA (1992)	General wetland buffer		30 m minimum
	Provincially significant wetlands		special treatment
	Flood plains in the absence of engineered flood lines		
	1 warmwater streams		15 m setback from top of bank
	2 coldwater streams		30 m setback from top of bank

Table 4.2 (Continued) Setbacks and buffer width recommended by agencies and authors in Canada in various situations

AGENCY OR AUTHOR	SITUATION	SETBACK
GRCA (1992) Laurel Creek Watershed Study	perennial streams intermittent streams and drainage swales other terrestrial features (i e woodlands, wetlands)	30 m 15 m as appropriate
Waterloo, City of (1993)	Constraint Level One - perennial streams Constraint Level Two - intermittent streams	30 m minimum from top of banks 15 m minimum from top of banks
Guelph, City of (1993) Hanlon Creek Watershed Study	general situations wetlands, streams, or other water bodies special circumstances	15 m minimum 30 m minimum up to 200 m minimum
Switzer-Howse (1982)	south-western Ontario sandy soils of Haldimand Norfolk strip subject to traffic combined with winter grain crop	1 2 - 3 m 7 5 m 4 m at least 1 m
Environment Canada (1980) Environmental Impact Control Directorate	Environmental Code of Good Practice for General Construction distance of roads and airstrips to any water body borrow sites vegetation and soil removal near wetlands grubbing operations near wetland/water body slash disposal blasting	 100 m 100 m 30 m site specific basis 200 m 400 m
Environment Canada (1979) Environmental Impact Control Directorate	Environmental Code of Good Practice for Highways and Railways distance of roads to any water body distance of road to a designated naatural sensitive area burn area gravel removal fill for construction purposes - any stream with fish machine clearing adjacent to stream with fish blasting - designated natural sensitive area blasting - streams, rivers or lakes petrochemical depots fuelling	 100 m 500 m 200 m 100 m 100 m 100 m 15 km 400 m 200 m 100 m

Table 4.3 Setbacks and buffer width recommended by agencies and authors in the United States in various situations

AGENCY OR AUTHOR	SITUATION	SETBACK	
Trimble and Sartz (1957)	logging road distance from stream in New Hampshire	direct correlation between slope and buffer width	
	Slope of land between road and stream (%)	Municipal watershed	General situation
	0	15 24 m	7.62 m
	10	27 43 m	13.72 m
	20	39 62 m	19 81 m
	30	51 82 m	25 91 m
	40	64 00 m	32 00 m
	50	76 20 m	38 10 m
	60	88 39 m	44.20 m
	70	100 58 m	50 29 m
Aubertin and Patric (1974)	distance of logging activities from streams in W Virginia	10 - 20 m	
Newhold et al (1980)	buffer effectiveness increases with width	30 m generally	
Karr and Schlosser (1977, 1978)	sediment filtration in Idaho	9 m	
Haupt and Kidd (1965)	good logging practices in central Idaho	3 54 m minimum, 10 62 m better	
Massachusetts Wetland Protection Act (1972)	activities which alter wetlands prohibited within buffer	30 m	
New Jersey Freshwater Wetlands Protection Act	excavation, fill, construction, and alteration of vegetation within buffer are prohibited	22 - 50 m for exceptional wetlands 7 - 15 for intermediate value wetlands	
Rhode Island Wetlands Protection Act (1983)	no alteration without permit	15 m from bogs, marshes, swamps or ponds	

circumstances, a minimum 100 metre setback is suggested, although the removal of vegetation and soil near wetlands is reduced to a thirty metre buffer.

In Ontario, the advocated setbacks are similar to those in the United States with fifteen to thirty metres being the most common, with several jurisdictions (GRCA, 1992b; OMNR, 1987; Waterloo, 1992) considering the buffer from top of bank. However, variations in recommended widths exist, even for watershed studies in the same drainage basin (GRCA, 1992b; City of Guelph, 1993). The Laurel Creek Watershed Study (LCWS) (GRCA, 1992b) recommended thirty metre buffers on perennial streams; fifteen metres on intermittent streams; and a width as appropriate for terrestrial features, including woodlots and wetlands. In contrast, the Hanlon Creek Watershed Study (HCWS) (City of Guelph, 1993) recommended thirty metre buffers as a minimum on streams, wetlands, and other water bodies, fifteen metres as a minimum in general circumstances; and up to a 200 metre minimum for special circumstances. Thus, intermittent streams were given twice the protection in the HCWS than in the LCWS.

The largest variation in recommended setbacks occurs in the agricultural sector. Recommended widths have ranged from up to five metres (Slater, 1985), to a minimum of three metres (OMAF, 1993). However, Switzer-Howse (1982) suggested that a 1.2 to 3 metre buffer is sufficient in most southwestern Ontario situations, with the width increasing on sandy soils to 7.5 metres, or could be decreased to one metre if used in conjunction with a winter grain crop. The validity of these widths is questionable, based on nutrient and sediment removal efficiency of buffer strips this narrow.

As the most critical issue facing the creation of buffer zones, buffer width is an issue for both functional - and human-induced reasons. Traditionally, buffers have been implemented on

a fixed-width basis, such as the dimensions offered by the OMNR (1987), or based upon limited site condition factors such as slope (OMNR, 1988). Municipally, the City of Waterloo has implemented specific distances through its Official Plan Amendment Number 16 of fifteen metres for intermittent streams and thirty metres for perennial streams. However, the County of Oxford draft Official Plan has avoided specific numbers, as Craig Manley (Director of Planning) reasons this allows the planners to look at the needs of the individual situation Manley notes the County had two options: a standard (fixed) width, or to address the needs of the individual situation (Manley, 1995). The County of Oxford incorporated this individuality into the process with buffer width determined by the proposed development type and location (Manley, 1995).

A major problem concerning width is the use of fixed values. According to Dave Cooper (Senior Planner, OMNR, Cambridge District), agencies are only beginning to consider what is needed for a buffer (the functions it is to provide, the feature being protected) and trying to create the buffer based on science (Cooper, 1994). The need for science to assist in land use planning at the municipal level is also evident. Brian Trushinski (Senior Planner, City of Waterloo) states an urgent need exists for research to determine what is considered a scientifically defensible buffer based on such factors as slope, soil texture, vegetation, and adjacent activities (Trushinski, 1995). However, Cooper (1994) notes it is difficult to match buffer width to physical factors, hence one of the rationales for a fixed buffer is that it is easy to define. Trushinski stresses that research must continue, as field specifics are now required, such as if a provincially significant plant is located five metres behind the buffer edge, or breeding birds use the buffer, how much distance is required to be set aside? (Trushinski, 1995).

A second factor required in conjunction with science is reasonableness. Trushinski cites a hypothetical situation of migratory birds being found in an Environmentally Significant Policy Area (ESPA) wetland, and therefore a one hundred metre buffer may be required. However, the future must be considered when those migratory birds are no longer in an ESPA surrounded by development. Naturalists have told Trushinski this will be the case, and therefore as development will continue and the birds will be gone, why is a one hundred metre buffer necessary? (Trushinski, 1995). Trushinski states that while the loss of the birds is regrettable, much weight cannot be placed on protecting the birds because the wetland is a dynamic rather than static system (Trushinski, 1995).

Buffer width is also important to the agricultural community. Agriculture is a business, and land dedicated to a buffer removes income-generating land from farm production For example, buffers cited in CURB reports (GRCA 1994a,b) indicate that on one farm a total thirty metre buffer (twenty feet one side, ten feet on the other) removed 1.6 acres from production (GRCA, 1994a), and a second buffer situation (twenty feet one side, fifteen feet other side) retired 1.4 acres from production on a farm (GRCA, 1994b). Hence, agriculture attempts to minimize the buffer width required, as OMAFRA recommends a minimum three metre buffer (OMAF, 1993). In the Environmental Farm Plan (EFP) package, buffers associated with streams and wetlands are considered. Andy Graham of the Ontario Soil and Crop Improvement Association was part of the subcommittee dealing with wetlands and wildlife ponds, and comments that it was a real education to sit around the table with representatives of the various interest groups and agencies and try to arrive at a consensus on what should be identified as an acceptable buffer strip (Graham, 1994). Farm groups recognized that buffers have merit, but were conscious that they do not generate income, and

thus were looking at buffer strips in the range of three to four metres as being adequate (Graham, 1994). On the other side were groups such as Ducks Unlimited that were advocating fifteen metres as a minimum, else the buffer would be a predator trap (Graham, 1994). This revealed a difference in attitudes and perspectives, as the farm community did not rate predation as a high priority, but it rated high for groups like Ducks Unlimited In the end a consensus was reached by the group. More than ten feet for streams rates "best" (no buffer rates "poor"), and greater than fifty feet for wetlands rates "best" (less than eight feet rates "poor").

Development is also influenced by buffer width. Like agriculture, buffer land removed from development is lost revenue to the developer However, in many circumstances the buffer is fully or partially located on floodplain that is not permitted for development The problem arises when the buffer should extend beyond the floodplain boundaries Under the Planning Act, a municipality can take five percent of the development for park land but there is no legislative requirement for both the five percent and a buffer, and if municipalities desire a buffer, Manley suggests they must mainly rely on bluff, intimidation, and negotiation (Manley, 1995). The municipality has no formal right to a wide buffer, and Trushinski says the City of Waterloo is lucky to get three times the drip line of the trees for a buffer (Trushinski, 1995) He also compares the city's position to playing a slot machine: while hoping to win, the city may lose if it becomes too greedy. Trushinski states that developers are currently willing to provide a reasonable buffer based on science, but if the municipality oversteps that limit, the developers will say no (Trushinski, 1995).

Trushinski also notes additional problems facing urban municipalities from the revised Planning Act. Under the new policies, cities must manage growth within their borders for

twenty-five years, and while environmental protection is necessary, the challenge is not to remove too much land from development so that human needs can be met during this period (Trushinski, 1995). As an example, Trushinski cites a developer not wanting to undertake a buffer study because of the cost, and instead gives the municipality a thirty metre buffer. The problem is that ten metres may be sufficient and twenty metres is almost a residential lot - a significant area to become part of the park system (Trushinski, 1995).

4.6 Effectiveness

A significant amount of research has revealed the effectiveness of buffers for sediment and nutrients removal (primarily nitrogen and phosphorous). A summary of results is provided in Tables 4 4 - 4.8.

Soil erosion is a major concern in every land use sector. Consequently, the ability of the buffer to capture and retain sediment is important. The sediment control effectiveness of buffers is largely dependent upon width and the soil type of the adjacent land. Wilson (1967) concluded that an inverse relationship exists between the necessary buffer width and the size of the soil particle. Therefore, a narrow buffer will capture a maximum amount of large sand particles, but small clay particles require a larger width.

For sediment capture, Neibling and Alberts (1979) concluded that 90% of sediment was captured by a 4.9 metre buffer, and 91% of this sediment was deposited within the first sixty centimetres. Lammers-Helps and Robinson (1991) state the deposition zone is typically 30-50 centimetres wide, and once filled, continues moving downslope in 50 centimetre intervals until the buffer is filled.

Table 4.4 Summary of Sediment Removal Research

Researcher	Buffer Width (m)	Type	Sediment Removal	Comments
Neibling and Alberts (1979)	0.6 - 4.9		90% of total sediment	91% of sediment deposited in first 60 cm
	0.6		37%	
	1.2		78%	
	2 4		82%	
	4.9		83%	
Wison (1967)	3.0		max % sand removal	inverse relationship between filtration
	15.0		max % silt removal	length required and particle diameter
	122.0		max. % clay removal	
Young et al (1980)	27.4	orchard grass	66% of total sediment	13 7 m simulated feedlot plot
	27 4	sorghum-sudan grass	82% of total sediment	
Bingham et al (1978)		fescue	near background levels	1·1 ratio of feedlot to buffer - 13 m in test
Magette et al (1987)	4.6		72% of total sediment	
	9.2		86% of total sediment	
Dillaha et al (1987)				more effective in cropland runoff due to decrease runoff volumes (infiltration of cropland vs concrete or compacted feedlot) resulting in lower sediment transport capacity
Paterson et al (1980)	35 0	fescue	71% of total sediment	
Dillaha et al (1989)	4 6		74% of total sediment	
	9 2		87% of total sediment	
Dillaha et al (1988)	4 6		81% of total sediment	efficiency dropped 9% between first and second
	9.2		91% of total sediment	rain simulations - strips may become less effective over time
Dillaha (1989)				buffers with cross slopes which channelize flow are much less effective
Dillaha et al (1988)				concentrated flow reduces efficiency by 40-90% - sheet flow required for buffers to be effective
Dillaha et al (1987)	up to 9 1	herbaceus	71-91% of total sediment	controlled small plot experiments less effective at removing small particle sizes (clay, silt and organic particles)
				Clay particles are highly reactive and are enriched in phosphorous and other chemicals

Table 4.5 Summary of Nitrogen Removal Research

Researcher	Buffer Width (m)	ype	Sediment Removal	Comments
Doyle et al (1989)	0 5		0% soluble nitrogen	
	1.5		57% soluble nitrogen	
	4 0		68% soluble nitrogen	
Dillaha et al (1989)	4 6	rass	63% total nitogen	
	9 1	rass	76% total nitogen	
Magette et al. (1987)	4 6		17% total nitogen (average)	individual results varied widely
	9 2		51% total nitogen (average)	

Table 4.6 Summary of Phosphorous Removal Research

Researcher	Buffer Width (m)	Type	Sediment Removal	Comments
Doyle et al (1989)	0 5		9% soluble phosphorous	
	1.5		8% soluble phosphorous	
	4		62% soluble phosphorous	
Dillaha et al. (1989)	4.6	grass	69% total phosphorous	93% of phosphorous in runoff sediment
	9 1	grass	82% total phosphorous	bound
Magette et al. (1987)	4.6		41% total phosphorous (average)	individual results varied widely
	9.2		53% total phosphorous (average)	

Table 4.7 The Impact of Buffer Zones on Phosphorous Transport. Results From Experimental Plot Studies

Source	Buffer		Analysis	Units	Reduction		
	width (m)	slope (%)			From	To	%
Thompson et al (1978)	12.0	4	Total P	mg l^{-1}	10.7	6	44
	36.0	4			10.7	3.2	70
Young et al (1980)	27.0	4	sediment P	kg ha^{-1}	18 24	1 04	94
			sediment PO_4 - P		7 49	0 28	96
			soluble P		9.45	2.25	76
			soluble PO_4 - P		6 29	1 43	77
Doyle et al (1977)	1.5	-	soluble P	kg ha^{-1}	0 077	0.071	8
	4.0	-			0.077	0.029	62
Edwards et al (1983)	30 0	2	total P	kg	55	28	49
	30 0	2			28	15	47
Dillaha et al (1989)	4.6	11	total P	kg ha^{1}	4 34	1 18	73
			PO_4-P		0 09	0.16	*
			soluble P		0 18	0 27	*
	9 1	11	total P	kg ha^{-1}	4 34	0 33	93
			PO_4-P		0 09	0 05	47
			soluble P		0 18	0 08	55
	4 6	16	total P	kg ha^{-1}	8 42	4 31	49
			PO_4-P		0 11	0 10	8
			soluble P		0 17	0 18	*
	9 1	16	total P	kg ha^{-1}	8 42	2 96	65
			PO_4-P		0 11	0 14	*
			soluble P		0 17	0 25	*
Magette et al (1989)	9 2	-	total P	kg ha^{-1}	13 7	7 7	44

* an increase in levels was detected

adapted from Muscutt et al 1993

Table 4.8 The Impact of Buffer Zones on the Nitrate Content of Subsurface Waters

Source	Location	Buffer Type	Change in NO_3 - N Concentartion (mg l-1) Recording Type	From	To
Peterjohn and Correll (1984)	Maryland, USA	19 m mixed woodland	spring	5 43	0 00
			summer	6 96	0 36
			autumn	6 89	0 28
			winter	10 30	1 44
			mean	7 40	0 52
		50 m mixed woodland	spring	5 43	0 15
			summer	6 96	0 45
			autumn	6.89	1 47
			winter	10 30	0 98
			mean	7 40	0 76
Lowrance et al (1984)	Georgia, USA	pine forest	Jan - Mar	4.3	0 3
			Apr - Jun	5.9	0 1
			Jul - Sep	2.1	< 0 1
			Oct - Dec	5.4	0 1
			mean	4.4	0 1
Jacobs and Gilliam (1985)	North Carolina, USA	50 m pine forest	mean	8	< 0 1
Pinay and Decamps (1988)	Southern France	150 m mixed woodland	mean	1 32	0
Knauer and Mander (1989)	Northern Germany	various	maximum	22	0 5 - 2 5
Cooper (1990)	New Zealand	grass	mean flux	1.16	0 08
Haycock and Burt (1991)	Southern England	24 m grass floodplain	event maximum	12	< 1

Generally, it can be concluded from the studies that a buffer of only 4 6 metres in width will capture at least 70% of the sediment, and doubling the width to 9 2 metres increases the efficiency to 90% removal on slopes under five percent Sediment removal is also beneficial for nutrient-bound sediment capture. Dillaha et al. (1989) found that 93% of the phosphorous in their study was sediment-bound, and Cooper and Gilliam (1987) that the amount of sediment-bound phosphorous increased with the percentage clay

Nutrient capture is also an important buffer function The role is more dependent upon vegetation than the surface roughness. Studies of nitrate removal from subsurface waters have also proven buffer ability to reduce these concentrations (Table 4 8) Peterjohn and Correll (1984) and Lowrance et al. (1984) are unique in recording variations in nutrient removal on a seasonal basis. However, these southern United States results are of limited use for northern climates where frozen soil and dormant vegetation impact upon nutrient capture and retention during the winter. Overall, research considering nutrient removal illustrates a wide variation of results for both nitrogen and phosphorous removal The few studies suggest that a 9 2 metre buffer will remove half of the given nutrients, although Draper et al (1978) state that a ten metre buffer will capture ninety percent of nutrients carried in runoff To ensure a high removal rate, the periodic harvesting and removal of buffer vegetation is suggested to ensure a net uptake of nutrients (Lowrance et al., 1984)

Riparian areas are known to act as sinks for sediments and nutrients, but little quantitative data exists regarding this process (Cooper et al , 1987) Despite lack of data researchers often use models to evaluate the effectiveness of the buffer for sediment control (Williams and Nicks, 1988; Flanagan et al , 1989; Tollner et al , 1977) and nutrient transport (Lee et al. 1989). The use of models would seem premature, given that riparian processes are

not fully understood Some researchers (Barfield et al, 1979; Hayes et al, 1979) have considered the sediment capturing ability of grass in a laboratory using metal strips to simulate grass blades This raises the question of applicability to actual vegetation, as the metal can simulate vegetation roughness, but not the growth aspect of grass.

Several other factors must be considered for buffer effectiveness. Water flowing through the buffer must be shallow and uniform in order to function effectively (Dillaha et al., 1988). Concentrated flow forms gullies, reducing the critical infiltration time in the buffer. The flow type is associated with the topography and precipitation intensity. A concave slope tends to concentrate flow, while a convex slope promotes a more even flow. In addition, a short, intense storm event often overloads the buffer, whereas long, gentle rainfall facilitates infiltration.

Activities on adjacent land also influence the buffer strip. The use of subsurface drainage that by-passes the buffer, including urban storm drains and agricultural field tile drains, reduces effectiveness. In addition, buffers should not be the only mitigation measure, but used with other BMP's to increase buffer performance.

The last factor affecting effectiveness is buffer structure and composition. The vegetation structure plays a critical role in sediment removal by creating surface roughness. A rough surface slows water flow, allowing sediment to be more easily captured. Simultaneously, the slower water flow increases the infiltration time, and therefore overall buffer effectiveness. This also influences the composition, as a treed buffer with little or no understorey has reduced capturing capability due to a lack of groundcover. The role of vegetation is further discussed in Section 4.7

Buffers are also economically effective. Burton et al. (1989) concluded that the economic benefits of replanting a buffer (including reduced erosion and improved habitat) were worth an estimated $10,500 per kilometre of buffer strip, while the cost of installing the buffer was only $1,900 per kilometre, a benefit/cost ratio of 5.5.

Although buffer creation is primarily a land use issue associated with the internal vegetative composition and buffer functions, a buffer is not isolated from the surrounding environment. The activities and practices on adjacent lands can impact the buffer, and therefore, must be considered in the buffer design (Table 4.9)

Table 4.9 Adjacent Land Utilization

Option	Positive	Negative
Forage Crop	* good erosion control * ensures required buffer width * access for maintenance	* if utilized with a grass buffer, chance of buffer encroachment when crop is rotated
Corn	* higher value crop * distinguishes crop from buffer	* higher erosion * wider buffer required * slower infiltration * if utilized with a grass buffer, good chance of buffer encroachment when crop is rotated
Development	* permanent buffer * generally variable width * official recognition	* usually not differentiated from parkland * lands often used for recreation * urban contaminants * current design facilitates encroachment

Source: Author

Adjacent activities can primarily be characterized into two broad groups development and agriculture. For development, the buffer has several advantages Through development, a permanent (generally variable width) buffer is established by legal survey, although usually limited to the floodplain zone, and is afforded some official zoning recognition by generally

being zoned 'open space'. Despite these advantages, buffers in development situations have several disadvantages. They are not specifically identified as an ecological feature and classified through 'open space' zoning as parkland. As part of parkland, they are accessible and susceptible to greater usage and degradation, especially if trails are created Degradation also results from encroachment, which is exacerbated by current urban designs that promote backlotting The actual development process can have a tremendous impact on streams, and unless adequate, a buffer can be inundated and destroyed by sediment. Lastly, along with the usual nutrients and sediments, the buffer must deal with urban pollutants, including heavy metals from storm water runoff.

Rural areas are equally susceptible to impacts, as crops range from forage to corn adjacent to the buffer Corn, while a higher value crop than forage crops, has serious erosion problems associated with it. Therefore, a wider buffer is necessary to compensate for the greater runoff Despite this, the differentiation of the crop and buffer reduces the likelihood of buffer encroachment. Forage crops have the advantage of providing good erosion control as the crop functions much like a grass buffer Consequently, a narrower buffer is possible since the crop functions as a buffer Yet, the lack of differentiation between the buffer and the crop can lead to encroachment during crop rotation.

For agriculture, despite the various impacts of adjacent cropping practices, Duke (1994) suggests that from a consistency, legal, and administrative viewpoint, it is easier to have a fixed buffer. This is the result of the complexity of a buffer varying with the adjacent crop, as one year one distance is acceptable, but the next year a different width is required.

Taylor (1994), Graham (1994) and Gosnay (1994) suggest that agriculture be given preferential treatment in required buffer width since agriculture involves people trying to make a living from that land, and therefore, buffer width should be kept to a minimum

4.7 Role of Vegetation

Buffers are generally ecological features, thus the role of vegetation must be considered. Vegetation positively influences water quality through nutrient uptake and providing surface roughness for sediment capture (Tables 4.4 to 4.8) Some species are more effective in providing these functions, and to this end, twenty-six Plant Material Centers in the United States assess, test, and make available suitable plant materiel for conservation programs (Oaks et al., 1989).

Buffers are multi-functional, with roles and functions impacting beyond water quality improvement Buffer strips can function as wildlife habitat and corridors in a natural heritage system, as streams and associated vegetative cover are ideal wildlife corridors since streams are natural linkages for wildlife movement. In Ontario, streams are promoted for this role (OMAF, 1993; OMNR, 1991a; OMNR 1991b; Riley and Mohr, 1994).

As wildlife habitat, riparian buffers have tremendous potential Dickson (1989) examined stream side zones at a forestry experimental station in Texas with three sizes of zones: narrow (7m-23m), medium (31m-40m), and wide (52m-93m) Squirrels were common in wide zones, but almost absent in the smaller zones Amphibians and reptiles were found abundantly in medium and wide zones with a canopy, shaded understorey and leaf litter, but less frequently in the narrow zone. This narrow zone, however, with dense brush and logging slash supported the largest number of small animals An abundance of wildlife at the edges is

not unexpected, as ecotone systems and edges usually contain a higher degree of biological diversity (i.e Yahner, 1988)

Buffers have been considered for wildlife protection and habitat since the 1940's for protecting waterfowl (Girard, 1941). For waterfowl protection in Iowa, Glover (1956) recommended the creation of a 137 metre vegetative zone (buffer) on wetlands to mitigate fire and overgrazing by cattle Hilditch (1992) noted that vegetation in the wetland buffer influences the productivity of nesting waterfowl This raises questions of species composition if one species is desired and the habitat is tailored to that particular species.

The composition of buffer vegetation is being re-examined. From an agricultural perspective, grass buffers have been the recommended design (Switzer-Howse, 1982, Slater, 1985, Moore et al , 1986), with the rationale that tree roots may clog tile drains (Irwin, 1987), and that grass allows access for stream or ditch maintenance (Slater, 1985), or the movement of machinery (Switzer-Howse, 1982). By contrast, trees are viewed as beneficial in that they provide a barrier against accidental tillage of the buffer (Hilborn, 1985).

Debate also arises concerning buffer maintenance. The agricultural perspective of the 1980's (Switzer-Howse, 1982, Hilborn, 1985; Slater, 1985) suggested active maintenance. However, the 1990's view is a minimal maintenance or maintenance free design (OMAF, 1993; Canada, 1992) The latter design advocates "naturalization", an approach supported by the Ontario Ministry of Natural Resources (OMNR, 1993), but not completely accepted by the agricultural community (K-W Record, February 10, 1994, B6). Similarly, naturalization is being considered in the urban park context (i.e. Waterloo, 1991) as a method to reduce municipal maintenance expenses

While vegetation is often viewed from a terrestrial perspective, it also improves aquatic habitat through stream shading by moderating water temperature. This has been considered in a southern Ontario (Barton et al 1989), the Rocky Mountains (Platts and Rinne, 1985), and the United States Pacific Northwest (Budd et al., 1987) Thus, vegetation improves fish habitat by reduced nutrients, sediment, and shading.

Vegetative composition is a function of primary and secondary buffer objectives Wayne MacMillan (Assistant Manager, Environmental Services Group, GRCA) notes a split in desired composition between agriculture and municipalities, as some agricultural buffers prefer a managed grass design to deal with a certain problem, whereas municipalities want to see the buffer naturalize over time (MacMillan, 1994). MacMillan is quick to note that a major limitation of naturalization is that over time shading may kill out the grass, increasing runoff, and necessitate building physical elements to compensate.

The vegetative role is notable not only for water quality improvement, but for water retention ability. Minshall (1995) notes that floodplain vegetation can significantly impact flood prediction for the GRCA and varies with the time of year An example Minshall cites is flood prediction on the Nith River between Wellesley and New Hamburg which takes an April flood eight hours to travel. However, an August 1975 flood prediction based on Spring 1974 and 1975 floods was totally off in timing. The time span completely doubled from eight to sixteen hours, and the only factor the GRCA can attribute to this is the heavy floodplain vegetation in August compared to the spring (Minshall, 1995)

For buffer vegetative composition, several options are available These are briefly summarized in Table 4 10. The basic vegetative option is a hybrid grass buffer that is quick to establish and easy to maintain. Although providing the primary function of water quality

improvement, grass provides limited secondary benefits. Since no stream shading is provided, fisheries habitat is not improved. As grass, it may require mowing several times a year to ensure maximum nutrient uptake, and therefore maintenance costs may be higher compared to a treed buffer. Lastly, grass buffers have no encroachment protection, as width can be decreased by mowing in urban areas, or by cultivation in rural areas.

Table 4.10 Buffer Composition

Option	Positive	Negative
Grass	* easy maintenance * quick establishment	* no stream shading * can require mowing several times a year * no encroachment protection
Native Grasses	* naturalization * ecologically friendly	* potential weed problems * same problems as grass
Scrub	* good animal habitat * provides some stream shading	* roots can clog tile drains * vegetation can clog stream * can reduce the groundcover for decreased roughness
Tree	* good stream shading * multiple use of trees * protects buffer from encroachment	* roots can clog tile drains * access to stream for maintenance reduced * buffer maintenance can be higher * long time to establish trees * non-native species can be invasive * reduced groundcover decreases surface roughness
Managed	* groomed appearance * attractive * safety in urban setting	* financial cost * requires buffer access for maintenance
Naturalized	* reduced maintenance costs * opportunity to re-introduce native species	* weed problems * slow establishment

Source Author

A variation of the grass buffer is the use of native grasses in buffer composition This has the advantage of utilizing native species that are hardier and ecologically friendly by being non-invasive. However, native grasses have the same problems as those identified for grass buffers, and are slower to establish than the hybrid grasses, creating potential weed control problems during the establishment period.

The next composition option is a shrub buffer. This provides good animal habitat as noted by Dickson (1989), and provides some stream shading for fisheries habitat Yet, the roots of shrub vegetation can clog sub-surface drains, and disrupt stream flow Additionally, increased ground shading reduces the groundcover that creates surface roughness that slows overland flow and traps sediment.

Treed buffers have numerous benefits, including a wider canopy for stream shading than shrub vegetation. Trees also protect the buffer from agricultural and management encroachment, and provides benefits of multi-use buffers Despite the advantages, trees have a variety of problems, including a long establishment period, roots affecting drains, potentially higher maintenance costs depending on tree use, and decreased stream access

Two management options are also available for vegetation managed or naturalized A managed system provides a groomed appearance, often considered more attractive than a naturalized buffer Managed buffers can also alleviate urban safety concerns, when used for recreation purposes, by increasing visibility along trails. Whether performed by government or the landowner, management has costs. This maintenance also requires access, usually by trail creation, which may not be a secondary objective of a particular area This trail can increase public accessibility into the area, leading to degradation.

The second option is a naturalized buffer with minimal maintenance In this respect, establishment costs are reduced as through natural succession, although often with some initial human assistance This creates an opportunity to reintroduce native species, including Carolinian species, a move supported by Amedeo Spagnuolo (Director of Planning, Township of North Dumfries) However, naturalization has weed control concerns that may require spraying This raises concerns over pesticide introduction into the sensitive riparian environment, which may require mowing, that can retard natural succession. Natural succession also takes longer to establish than a managed buffer.

4.8 Retrofitting

Retrofitting is almost exclusively an urban issue dealing with buffer establishment within existing development As it is located within a developed area, buffers are more difficult to implement than in a greenfield development. Trushinski (1995) attributes this difficulty to a hypocrisy among people that want to protect the environment as long as their lifestyle is not impacted (Trushinski, 1995) In urban areas, the view is that environmental protection affects landowners and farmers with much land, but an urban community is either beyond redemption or perceived as not having a problem (Trushinski, 1995).

In situations such as parks, buffers are easier to retrofit. Ionson (1994) cites a current situation in Cambridge where Mill Creek flows through Soper Park, a highly manicured park with a channelized stream that was hard bottomed one hundred years ago and which is now in need of repair. According to Ionson, the repair has allowed city staff to explore design alternatives, including natural channel design.

However, serious problems exist for retrofitting in non-park settings as a result of physical limitations. Ionson comments that retrofitting often depends on the location of development and roads to a creek, and the past stream treatment If the stream is a concrete channel with buildings to the edge, then naturalization is extremely difficult since channelization was undertaken to maximize development encroachment (Ionson, 1994) MacMillan (1994) notes the loss of urban floodplain storage has limited the GRCA's ability to undertake soft work like buffers since water volumes are a major concern Yet, MacMillan still believes naturalization can occur in heavily channelized areas

Retrofits also face the problem of public acceptability Trushinski (1995) notes that people generally do not like buffers, and the city utilizes a buffer through what they call the "ten and three" policy where the city allows the grass within one and one-half metres of the top of streambank to grow to ten inches in height before being cut back to three inches People like the idea of buffers, but often do not like them in reality, arguing that rabid animals may live in the buffer, the long grass makes it dangerous to walk along the stream, and mosquitoes breed in the buffer (Trushinski, 1995). The City of Waterloo is removing the retrofit difficulty by addressing storm water management ponds and buffers when a subdivision is established, resulting in "buyers beware. Trushinski notes that stormwater management ponds and buffers will require time and education to gain public acceptance, and William Sleeth (Landscape Architect, City of Kitchener) believes that naturalization should be a component of every park to get people familiar to this type of management and visual diversity to avoid the lollipop and carpet approach of the past (Sleeth, 1995).

Retrofitting creates several challenges, and as such, several options for buffer implementation within developed areas must be considered (Table 4.11) In many

circumstances, the decision not to retrofit is a realistic and viable choice. This alternative is easy to accomplish, as land may not be available No buffer is also practical, since it does not require the potential use of financial resources to buy property for a buffer in areas where land values are high. The major limitation of taking no action is that no water quality improvement occurs and no secondary benefits are realized.

Table 4.11 Retrofitting Options

Option	Positive	Negative
Nothing	* easy to do * practical	* no solution to water quality problems * no secondary benefits
Limited	* implemented in limited cases * in conjunction with storm water management ponds	* not end unto itself, but in conjunction with other measures (sediment ponds) * partial implementation debatable
Full	* improvement of water quality * full buffer network * true integrated management	* may not be feasible * very expensive * not end unto itself, but in conjunction with other measures (sediment ponds)

Source: Author

A second option is to proceed with limited retrofitting. This can occur when lands next to watercourses are redeveloped, on municipally owned parkland, or as part of storm water management retrofitting. However, the buffer must not be viewed as an end unto itself, but in conjunction with other water management measures, such as sediment ponds. The impact of a buffer becomes questionable in a developed situation if water entering the stream from storm drains by-passes the buffer. Additionally, the impact of limited implementation is also questionable, as sporadic implementation has limited value in water quality improvement.

A third choice is for a full buffer retrofit. This will improve water quality (if not by-passed by storm drains); allow for a full network of buffers, thereby making wildlife and recreation corridors possible; and realize integrated management by allowing multiple objectives to be met. Yet, full retrofitting is not always feasible, as lands may not be available to implement the buffer, and the costs to acquire and maintain these municipally owned properties can be expensive. Again, the buffer must be used in conjunction with other management measures, such as sediment ponds, for maximum effectiveness

4.9 Design Models

Several options for buffer design models exist (Table 4 12) The simplest option is not to create any buffer. This has the advantage that no change in the current situation is required, and no costs are incurred for implementation programs. Nevertheless, the problems necessitating a buffer, namely nutrient and sediment problems, are not addressed Buffers are advocated to alter inadequacies of this situation.

A second buffer design with many benefits is the fixed width model It allows easy width demarcation in buffer establishment, and therefore, is easily incorporated into zoning by-law maps. A fixed value can also address land value concerns by being determined through benefit/cost analysis. In this respect, the maximum retention ability of a buffer can be factored by the value of adding an additional metre of buffer A fixed buffer has the disadvantage that the width may be either too narrow to adequately function based upon site conditions, or conversely, may be excessive and, therefore, a waste of land.

A third design option, the variable-fixed model, has an adaptiveness advantage by allowing a wider buffer when needed. In contrast to the fixed buffer, this variability allows the

width to be determined on local conditions. However, the design has the problem that the fixed distance may be excessive relative to local site conditions. Unlike the fixed model, the variability is more difficult to incorporate into general planning documents.

Table 4.12 Buffer Width Options

Option	Positive	Negative
No Buffer	* no change from the current situation * no cost incurement * in many cases, buffers may already exist	* problems of water quality not addressed * multiple objectives not addressed * no improvement in current situation
Fixed	* easy demarcation for recognition * easy incorporation into zoning * land can be fixed to deal with land use concerns and b/c analysis	* distance may not be wide enough for certain circumstances * distance may be larger than necessary and a waste of land
Variable-Fixed	* adapts width to situation by going wider when necessary * based more on local conditions	* more difficult to incorporate into planning documents * distance may be larger than necessary and a waste of land
Variable	* completely adaptable distance * ecologically sound * flexibility allows neither too much or too little distance	* can require more land than economically desirable * extremely difficult to incorporate into planning documents * may require surveying and associated expenses

Source: Author

A fourth design model is a completely variable buffer width. This is the best design model as it allows the distance to be completely dependent upon local conditions. This is also one area in which GIS is becoming a useful tool for information handling and buffer analysis (Wei-Ning Xiang, 1993). Although ecologically sound, this model can require more land than is economically desirable in agricultural and development circumstances. The variability of

design is also extremely difficult to incorporate into general planning documents, and to properly recognize, the buffer requires a survey. Despite the advantages of a variable buffer, the disadvantages outweigh its usefulness for practical circumstances

Another design beyond width models is the economic model The relative economic value of buffer strips and agricultural commodities has been compared in a model that considers what width is deemed publicly acceptable (Lant and Tobin, 1989, p 340) Lant and Tobin (1989) suggest that the marginal benefits of buffers are high at the stream bank, but decrease with increasing distance from the stream Conversely, agricultural returns increase farther from the stream bank as land becomes more accessible for machinery and livestock This model considers the buffer opportunity cost as including the sum of the net agricultural revenues forgone and the actual cost of the buffer strip establishment The benefits of wetlands are not directly realized by the farmer and are not considered in land use decisions

4.10 International Experiences

The use of buffers is not indigenous to Canada and the United States It is being considered by nations world-wide In South Africa, twenty to forty metre buffer strips are recommended on each side of perennial streams to protect against logging impacts (Bosch and Hewlett, 1980). This contrasts with New Zealand, where narrower, ten metre strips have proven effective in mitigating logging impacts (Easter et al , 1986)

In Europe, the use of buffers to control non-point source agricultural pollution has only recently begun. In Northern Germany, different types of buffers have been considered (Knauder and Mander, 1989), and in the United Kingdom, five metres is the minimum recommended buffer width (Muscutt et al , 1993).

Australia has broadened the scope of recommended areas for buffer use While promoted relative to forestry activities (Clinnick, 1985), their use is also advocated in the protection of Marine and Estuarine Protected Areas (MEPAs) by the Australian Committee for the International Union of Nature and Natural Resources (ACIUCN, 1986) No actual dimension is recommended, only the general consideration that a sufficient width is allowed to limit the impact of external events on the core protected area

4.11 Conclusions

The review of buffer literature identifies those areas that have received research attention, and those still requiring attention This review has revealed several concerns First, there is a lack of a coordinated approach to the discussion of buffers, as each sector discusses buffers with its own specific context. There has yet to be a comprehensive overview of buffers looking at the various aspects of the many factors described above Despite the numerous studies considering nutrient and sediment retention abilities of buffers, no consensus on necessary width or suitable vegetation has been reached

Most significantly, the research has largely ignored the way in which buffers can be implemented. While describing the many benefits and uses of buffers, a lack of consideration has been given to the implementation of a buffer system In this regard, environmental planning for buffers has been limited to the normative level This level of analysis is not yet complete, and should be continued to answer many of the specific questions that remain unanswered However, the concept of a buffer is generally recognized as desirable, therefore, research must move into the strategic and operational stages. The strategic level considers what can be implemented, that is, an implementation strategy for buffer zones within the current context

This is the aim of the current research paper While academic research cannot proceed from the strategic to the operational stage, considering institutional arrangements increases the chances of a proposed strategy being approved.

From a technical perspective, there are several design options for buffers, from the fixed width model to the variable width model Based upon the advantages and disadvantages, the fixed-variable model is the most desirable. Combined with this are the various options for vegetative composition These affect the various secondary objectives of the buffer, and therefore, the composition should reflect the goals and objectives in achieving these secondary goals These goals and objectives should reflect input from the public who will be directly impacted, and attempt to mitigate the concerns of landowners.

Retrofitting is important for existing development. However, given the difficulties of implementing retrofits into existing development, the best option is to leave buffers until opportunities exist. These opportunities should be addressed by an appropriate ecological planning approach, which for buffers is a watershed/subwatershed approach. When undertaking these planning approaches, public participation is desirable to reduce the burden to the public sector in the management of buffers, and to increase the public's responsibility in planning and managing natural resources in Ontario.

Chapter Five

Institutional Analysis

5.1 Introduction

Within the Province of Ontario, many different institutions are responsible for the management and planning of water and land resources related to riparian buffers. The primary interest and responsibility are focused at the provincial and municipal levels.

Relative to research objective one, this chapter is intended to facilitate an understanding of the existing management framework for riparian buffers in the Grand River watershed. By understanding the basic framework through which management occurs, the need for an integrated management framework becomes evident. This examination leads to recommended potential changes in Chapter Seven.

This chapter is divided into two sections. Initially, the provincial context is examined by considering the five provincial agencies with a role (mandate) or interest in riparian buffers: the Grand River Conservation Authority (GRCA), the Ontario Ministry of Natural Resources (OMNR), the Ontario Ministry of Environment and Energy (MOEE), the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), and the Ontario Ministry of Municipal Affairs (OMMA). The second section considers the municipal perspective through two case studies: the Regional Municipality of Waterloo, and the County of Oxford. All components are considered relative to the analytical framework presented in Chapter Three.

5.2 Provincial Agencies

5.2.1 Grand River Conservation Authority

The Ontario government in 1946 passed the Conservation Authorities Act based upon three principles

1 the initiative for the establishment and support of a conservation authority with the power to carry out conservation works within the watershed must come from the local people,
2. the best unit on which to co-ordinate all conservation work dealing with renewable resources was the watershed;
3 if local people showed initiative and support, the Ontario government would be prepared to provide the technical advice and financial assistance in the form of grants

(GRCA, 1992, p. 1.2)

Under the Act, the Grand Valley Conservation Authority (GVCA) was created in 1948 The current Authority dates from 1966 with the amalgamation of the Grand River Conservation Commission (1938) and the GVCA.

Legitimation

The mandate of the GRCA, as for all Conservation Authorities, is outlined by the broad objective statement of Section 20 of the Conservation Authorities Act:

> The objects of an Authority are to establish and undertake, in the area over which it has jurisdiction, a program designed to further the conservation, restoration, development and management of natural resources other than gas, oil, coal and other minerals.

To meet this mandate and create appropriate management policies and programs, the GRCA in 1990 updated the Authority's Vision Statement, Mission Statement, and Goals and Objectives. These statements focus on the themes of sustainability and a healthy watershed environment,

and buffers are one method of promoting these statements To support the Mission Statement, several goals were identified. These include conservation, protection and restoration of water, land, forests and wildlife, integrated resource management on a sustainable basis, safety of watershed residents with respect to natural processes and hazards, preservation and protection of landscapes and human heritage resources, the protection and enhancement of recreational opportunities, and public understanding and appreciation of the relationship between human activities, natural systems and human heritage resources (GRCA, 1992) An integrated buffer management framework is compatible with these goals

The GRCA is funded through various sources, including municipalities, the province, NGO's, and Authority revenue generating activities. This funding allows the Authority to undertake conservation programs, management functions, and acquire conservation lands, all of which can include programs promoting buffers Besides these sources, the GRCA established a non-profit, registered charitable funding arm in 1965 - the Grand Valley Conservation Foundation. The objective of the Foundation is to "create and operate a fund to be used exclusively for the benefit of the Grand River Conservation Authority in the cultivation and advancement of conservation in the Province of Ontario" (GRCA, 1992a 6) The GVCF as one of its projects undertakes property acquisition for the Authority from its funds, or in the form of land dedications or bequests Past acquisitions have been parcels of land, not easements, although the potential of the GVCF to function as a land trust is increased as land trusts become more widely used in Ontario

Reduced funding has affected GRCA programs According to Lorrie Minshall (Manager of Watershed Resources Planning), the Beaver Creek project was originally to

involve all the upper Laurel Creek watershed area with stream rehabilitation, buffers, land retirement, and access management projects However, funding requirements necessitated limiting projects to only the Beaver Creek subwatershed (Minshall, 1995)

The GRCA has also been financially impacted by Conservation Land Act programs, as in 1993 the province removed the property tax rebate on Conservation Authority owned lands (Cooper, 1994) The Authorities achieved partial re-instatement of the program, but further funding cuts may see this removed. Hence, according to Chris Gosselin (Manager, Environmental Services, Region of Waterloo), Conservation Authorities would be reluctant to acquire buffer lands by purchase or donation if an unfavourable tax situation exists (Gosselin, 1994)

The GRCA also plays an important regulatory role By maintaining the regulatory floodline and establishing fill lines, the GRCA regulates development in the flood plain and creates a setback between the watercourse and development. However, while affecting development, these regulations do not specify activities within the flood plain, thus a vegetative buffer may or may not exist. The GRCA currently requires a fifteen metre setback for built use (Minshall, 1995) As these regulations are separate from the Planning Act, the GRCA role is not affected by changes in the Planning Act

Functions

To achieve the mandate, role and goals of the Conservation Authority, the GRCA undertakes a number of management functions of both a generic and substantive nature. Many of these are identified in the six objectives of the Authority: watershed research, policy

development, proactive planning, plan implementation, and public profile and awareness (GRCA, 1992a 1 5) One of the key objectives of the Authority is watershed research to promote a greater understanding of the dynamic ecosystem of the Grand River watershed, and the demands that human populations place upon the natural resources of the watershed This objective is an excellent opportunity for the GRCA to conduct riparian buffer research and identify buffer opportunities within an ecosystem framework

The Authority is actively pursuing watershed research The Grand River Corridor Study for Waterloo Region (released in early 1995) is one example of research in which buffers are expected to play a role in plan implementation, and in the Grand River Watershed Plan (GRWP) that has recently begun. This latter project is a large undertaking requiring the creation of an information base, and the Authority has reorganized itself to achieve this information base. The GRWP is founded, according to Minshall, on two initiatives The first is to strengthen the watershed context for functions such as program delivery, and the second to become more visible to the community (Minshall, 1995)

The Authority also monitors for the effects of management decisions and actions upon the natural system. There have been a number of buffer programs over the years, including the Permanent Cover I and II programs, and SWEEP programs, but as Wayne MacMillan (Assistant Manager of Environmental Services Group, GRCA) notes, once the programs ended, the buffers were not monitored for effectiveness (MacMillan, 1994) This lack of monitoring has been the result of limited financial and human resources

The Authority also plays a key role in policy development It is through this policy role that appropriate interdisciplinary and integrated resource management approaches can be

developed to guide the Authority in policy formulation and revision The Authority in 1991 released a discussion paper on integrated wetland management that included a section on wetland buffers (GRCA, 1991). The GRCA proposed expanding the buffer zone from the existing thirty metres to a fifty metre design based upon three zones. The first zone, the Preservation Zone, consists of the twenty metres immediately next to a wetland in which existing grades and vegetation are maintained and new lots are not permitted. The second zone, designated Buffer Development or Enhancement, is twenty metres wide and existing vegetation and grades can be maintained or enhanced to the benefit of the wetland. Acceptable land uses for this zone include forestry, pasture, and parks/open space with no alteration to drainage Similar to the Preservation Zone, new lots are not permitted to extend into this zone. The third zone, Development Control, is ten metres wide. Identified uses would be allowed that did not intercept the water supply to the wetland, result in forest clear cutting, result in large-scale site grading, or include the locating of sewers in the zone. These zone limits are adjustable, based on impact studies. Unfortunately, this design was never adopted, as MacMillan states the size restrictions were unacceptable to local councils. The GRCA has returned to a thirty metre wetland buffer (the same as the OMNR), but MacMillan notes the OMNR has expressed interest in a fifty metre buffer (MacMillan, 1994). Despite these recommended distances, the final decision around provincially significant wetlands for buffers is determined by an EIS.

The Authority also promotes proactive planning that provides a forum for early discussion and conflict resolution. This approach is used to encourage joint planning initiatives for considering long-term resource use and a range of management alternatives. This is

currently being achieved through subwatershed studies which is also useful in combating cross-boundary planning problems by bringing the various stakeholders to the table One such example where the GRCA is facilitating stakeholder interaction is in the Fairchild Creek watershed. The Fairchild Creek system involves four upper tier municipalities, and MacMillan stresses that efforts desired by the GRCA require cooperation, as the spatially large and dynamic area contains significant habitat, wetlands, and many environmental constraints (MacMillan, 1994).

The GRCA is also responsible for developing plans and projects reflecting the Authority's management policies and approaches One method is to lead by example on Authority lands. For buffers, the GRCA can lead by ensuring the protection of existing riparian buffers and restoring degraded riparian buffers on Authority owned lands The GRCA also has programs, such as the Beaver Creek project, involving the "Three W's" woodlots, wetlands, and wildlife (MacMillan, 1994). The Three W's program involves applying extension services on a site-by-site basis under the framework of a watershed plan, and the program or plan put together for Three W's buffer affects wildlife and agriculture The Authority also has a Fisheries Rehabilitation Program in which the GRCA works with local communities and NGO's (i.e. OFAH and Steelheaders) to conduct stream rehabilitation, including riparian bank repair (Minshall, 1995).

A key aspect for the Authority is education. Through public participation and information, the goal is to increase public and agency support for the Authority and management objectives. This advances the GRCA's profile as a key resource management and planning agency in the Grand River watershed. The educational aspect for riparian buffers is

evident in buffer demonstration sites, such as the Beaver Creek project, as these can educate farmers on the benefits of buffers and facilitate landowner adoption of buffers.

Structure

The GRCA, like all Conservation Authorities, has a functional relationship with the local municipalities and the province. As part of this relationship with the province, Conservation Authorities report to the Ministry of Natural Resources through the Aquatic Ecosystems Branch. It is through the OMNR that approval is granted for programs and projects of the Authority, reports are made to the Management Board of Cabinet for program funding, and ministry funds are allocated to the Conservation Authorities.

The GRCA represents forty-five participating municipalities. The current membership of the Authority (after restructuring) is twenty-nine people, with twenty-six municipal representatives and three provincial appointments. Through representation on the Authority, local municipal concerns can be expressed to influence Authority direction in the development of a buffer policy within the Grand River watershed.

The Authority has recently restructured (late 1994 - early 1995). The 1994 structure is presented in Figure 5.1 Under the CAO, Division Directors are responsible for long-term planning, budget preparation, program direction, program monitoring, and staff performance. These divisions are comprised of departments headed by managers reporting to the Director. The Water Management Division has dealt with buffers for the GRCA.

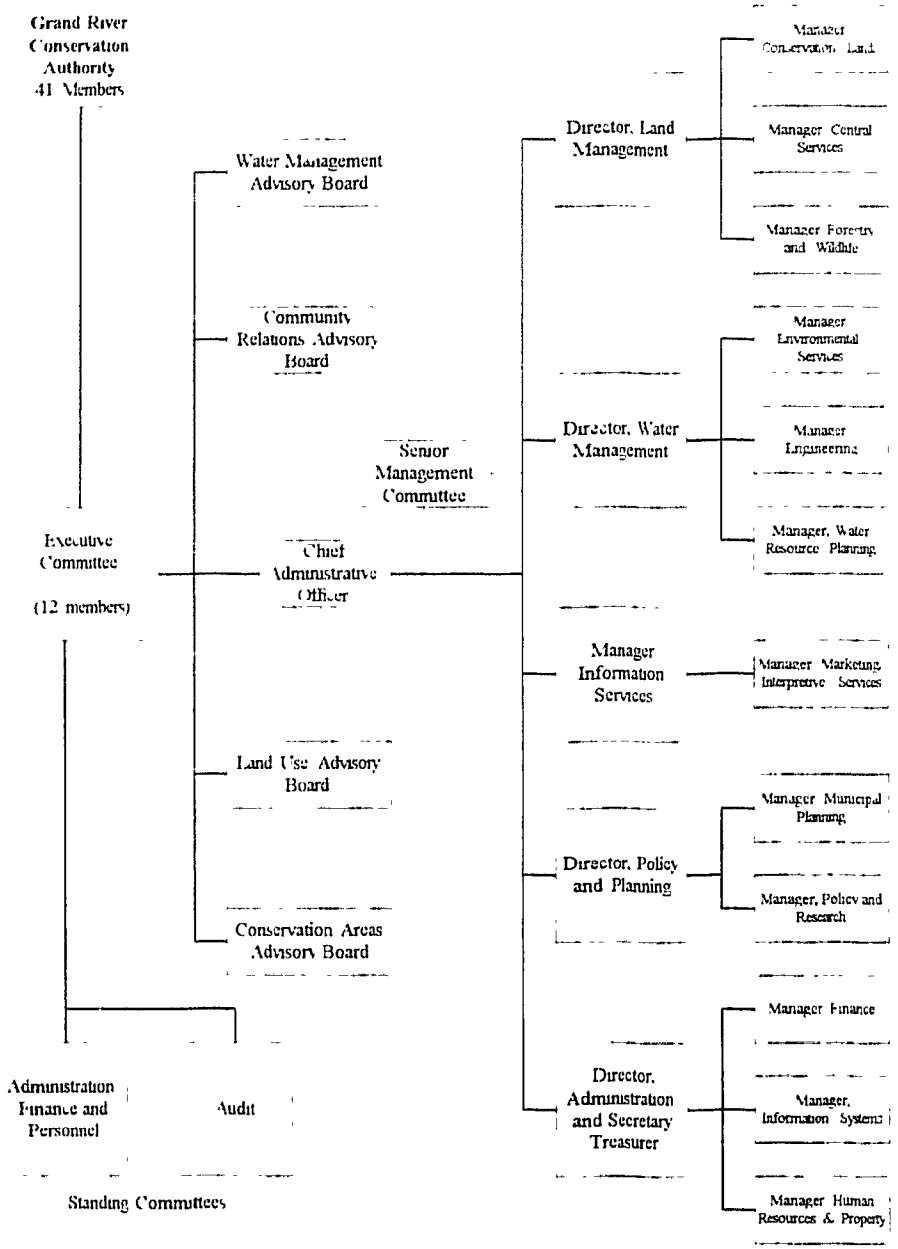
Processes and Mechanisms

The GRCA has many external linkages applicable to buffers. Minshall (1995) notes the linkages between the GRCA (and Conservation Authorities in general) and the Ministry of Environment (MOE) were strong in the late 1970's and early 1980's, but as the MOE began concentrating more on contaminants, the links weakened. As watershed planning grows, the connections are re-establishing, including stronger links to the Watershed Section of the MOE. This link with the MOEE is also evident in the GRCA administering the Clean Up Rural Beaches (CURB) program on behalf of the MOEE. However, the MOEE representative is from the Hamiliton Regional Office, not from the MOEE Cambridge District Office (Shantz, 1995). This indicates a lack of contact with the local District Office.

Locally, links between the GRCA and OMAFRA are weak regarding buffers. Harvey Wright (Soil and Crop Advisor, OMAFRA, Waterloo Field Office) notes that his GRCA contact is primarily with Charlie Roland through the role of recommending forage crops for conservation plantings (Wright, 1995). Minshall suggests that the links to OMAFRA for buffers still require improvement (Minshall, 1995).

The GRCA is also dependent upon the OMNR for program and project approval, and the province in general for funding. The Conservation Authorities also have some influence with the OMNR, as the OMNR guidelines on natural channel design were the result of pushing from the Conservation Authorities (Minshall, 1995). The GRCA's most notable linkage is to the Conservation Authorities Section located at the Southern Region Office that provides project funding and approvals, and administers the provincial appointment selection process.

Figure 5.1 GRCA Organizational Structure, 1994



Source: Adapted from GRCA, 1992a

Politically, the Authority has linkages to municipal governments through appointed representation The municipal representatives act as liaison between the municipality and the Authority by expressing local concerns, and by keeping local councils aware of Authority programs and projects According to Ralph Beaumont (Manager of Communications GRCA) this linkage to local councils has varied in the past with some members being interactive with the local council and others less active (Beaumont, 1995) However, with the recent reorganization and changes in the Authority membership, Beaumont (1995) says the GRCA is developing a program for members to improve the interaction between the Authority members and local councils The political representation of local municipalities makes Conservation Authorities unique among provincial agencies While reporting to a provincial ministry, the GRCA is also a political entity with decisions and direction determined by the membership The link to municipalities also exists in the regulatory role that the Authority plays regarding flood plains and fill lines which influence buffers

Organizational Culture and Attitudes

The GRCA, like all Conservation Authorities, views itself as a lead conservation agency in Ontario This attitude is partly the result of their mandate, and partly justification for survival. Despite almost a half century of existence, Craig Manley (Director of Planning County of Oxford) suggests that Conservation Authorities are not yet universally loved by the public. They are viewed as duplicating services provided by other ministries, with too much power over local issues. This notion of Conservation Authorities potentially having too much power over local matters is suggested by Ted Taylor (OMAFRA. Resources and Regulations

Branch) While Conservation Authorities are well received locally, it is suggested that this is not the case in eastern Ontario MacMillan notes that land owner resistance to wetland evaluations exists in eastern Ontario, and Minshall (1995) comments that the objections to watershed planning in the new comprehensive policy statements of the Planning Act may have come from the municipalities east of Toronto. With budget cuts and government downsizing, Conservation Authorities are concerned about their ability to manage and enhance resources. To state the importance of their conservation role, the Conservation Authorities filed a document, Resource Management in Ontario - "A Blueprint for Success" with the Commission on Planning and Development Reform in Ontario (Credit Valley Conservation Authority, 1993) The first justification of Conservation Authorities is that as government attempts ecosystem planning (i e. planning ecological features such as natural heritage systems and buffers), the only provincial agency structured on ecological units are the Conservation Authorities The second reason is that the conservation of renewable resources is a legislated mandate of the Conservation Authority With increased watershed planning, it is argued by the Association of Conservation Authorities of Ontario that the Conservation Authority should be the lead agency

Summary

The GRCA is a major actor in buffers within the Grand River watershed. This role is supported by the conservation mandate in the Conservation Authorities Act, and the regulatory functions the Authority provides. The Authority has been active in developing a buffer policy for wetlands, although this policy has not been implemented. The GRCA also undertakes

watershed research, projects and educational functions for buffers, such as the Beaver Creek demonstration project. The Authority has links to municipalities through watershed planning and representation, and is helping to overcome boundary problems by integrating initiatives on a wider scale. Links to other agencies are strongest with the OMNR, while MOEE links are being re-established, and OMAFRA links need improvement.

5.2.2 Ontario Ministry of Natural Resources

Legitimation

The Ministry of Natural Resources was created and is legitimated by the Ministry of Natural Resources Act. As its mandate, the OMNR is

> responsible for managing Ontario's natural resources, in accordance with the statutes it administers. As the province's lead conservation agency, the Ministry of Natural Resources is the steward of provincial parks, natural heritage areas, forests, fisheries, wildlife, mineral aggregates, fuel minerals, and Crown lands and waters which make up 87 percent of Ontario. (MOEE, 1994d)

The OMNR has developed an overall ministry goal and objectives. To meet this mandate, the ministry's goal is "to contribute to the environmental, social, and economic well-being of Ontario through the sustainable development of natural resources" (OMNR, 1992: 8) To this goal are four contributing objectives:

1. To ensure the long-term health of ecosystems by protecting and conserving our valuable soil, aquatic resources, forest and wildlife resources as well as their biological foundations;
2. To ensure the continuing availability of natural resources for the long-term benefit of the people of Ontario;
3. To protect natural heritage and biological features of provincial significance,
4. To protect human life, the resource base and physical property from the threats of forest fires, floods and erosion.

(OMNR, 1992 8)

To achieve sustainable development, the ministry uses three supporting strategies: Partnerships in Resource Management, Valuing Resources, and Improved Knowledge Base. Partnerships are important and desirable by including the public directly in the benefits and responsibilities of private stewardship. The OMNR aim is to seek out partnerships with agencies and groups involved in resource management, which Loftus (1995) states includes stream rehabilitation for buffers with NGO's such as Steelheaders or Trout Unlimited.

In valuing resources, a greater range of values is considered. Traditionally, only direct financial values have been considered, but indirect and intrinsic resource values will also be considered, including the social costs of resource development. Lastly, an improved knowledge base is needed to allow for informed decisions on future resource development.

The OMNR is responsible for many statutes with an impact or potential impact on riparian buffer zones. Of these statutes, the most important is the federal Fisheries Act which the OMNR administers. The Fisheries Act is designed to protect fish and those natural habitats supporting fisheries. Fish habitat is defined by the Act as "Spawning grounds and nursery, rearing, food supply and migration areas on which fish depend, directly or indirectly, in order to carry out their life processes" (Section 31(5)). The Fisheries Act is very specific about the impact of the addition of deleterious substances to water frequented by fish. Thus, buffers are important mechanisms for protecting water quality and the protection of fisheries habitat. Those guilty of an offense under the Act face a fine up to $5,000 or a prison sentence of up to twelve months (Fisheries Act, S.61(1)). According to Loftus (1995), this Act is used reactively rather than proactively for water quality problems. Thus, this Act is not used proactively to promote buffer creation.

The Endangered Species Act allows Cabinet to make regulations declaring the protection of species of flora or fauna threatened with extinction. Under the Act, no person shall willfully kill injure or interfere with any species of flora or fauna, or destroy, interfere with or attempt to destroy or interfere with the habitat of any flora or fauna declared to be threatened under the regulations (Endangered Species Act, S.5). Contravention of the Act and conviction could result in a fine of up to $50,000 and/or a prison term of up to two years (Endangered Species Act, S.6). If this statute is applicable to a site specific situation (i e endangered species are present), this may be one method to prevent habitat destruction in riparian corridors.

The Lakes and Rivers Improvement Act is one statute that initially would not appear to affect riparian buffer strips. However, a closer inspection of the Act reveals otherwise Section 36(1) of the Act states:

> Where any tree, part of a tree, refuse, substance or matter has been thrown or deposited in a lake or river or on the shores or banks thereof in such a manner as, in the opinion of the Minister, impairs the natural beauty of the lake or river, the Minister may order the person committed or caused the commission of such act to take such steps within the time specified in the order as are necessary to remove the tree, part of a tree, refuse, substance or matter has been thrown or deposited in a lake or river or on the shores or banks thereof

Thus, a mechanism exists to ensure buffer maintenance by private individuals. A person convicted of non-compliance with the order faces a $50 fine for each day in violation with the order (Lakes and Rivers Improvement Act,. S.36(2)). However, this section does not stipulate that the adjacent shore or bank be treed. This Act is generally not used unless within a forestry context according to Loftus (1995).

For buffer establishment, mechanisms exist within the Woodlands Improvement Act and the Forestry Act. The Forestry Act permits the minister to enter into agreements with owners of land suitable for forestry purposes on appropriate terms for a minimum twenty-year period Within the definition of these two statutes, forestry purposes are deemed to include "the production of wood and wood products, provision of proper environmental conditions for wildlife, protection against floods and erosion, recreations, and protection and production of water supplies" (Forestry Act, S 1). These forestry agreements are registered and binding upon subsequent landowners. The Minister may also establish programs for the encouragement of forestry under terms determined by the minister, including ministry services and potential grants. The ministry may also provide the land owner with nursery stock to facilitate planting. The Woodlands Improvement Act is similar to the Forestry Act, but a woodland size requirement exists. A woodland must have at least 1000 trees of all sizes per hectare, or 750 trees per hectare over five centimetres in diameter; or at least 500 trees per hectare over twelve centimetres in diameter; or 250 trees per hectare over twenty centimetres in diameter (Woodlands Improvement Act, S.1). Under this Act, a buffer must meet these critical woodland size requirements to qualify for programs under this Act.

Functions

The OMNR provides many environmental functions. Viewing itself as the lead provincial conservation agency through the Direction 90's strategic document, the OMNR provides general management and leadership for conservation initiatives. Each component of the structure performs different functions.

The Policy and Program Division (Aquatic Ecosystems Branch), has five functions applicable to buffers. First, to undertake strategic planning to position the OMNR policies and programs for the future (the actual creation of a buffer policy) Second, to conduct research to provide scientific knowledge about ecosystems and management options (conducting research on what constitutes an appropriate buffer based upon site conditions) Third, to lead in policy and program development, including policies, legislation, standards and programs, and to advise senior management to ensure consistency of government direction (coordinating a buffer policy that is consistent across the province). Fourth, to ensure effective interpretation and transfer of policies and programs through marketing and education (landowner education through extension services on buffers). Fifth, to conduct monitoring and evaluation to ensure consistent implementation of policies and programs and are effective in achieving desired goals and objectives (are buffers being effective based on goals and objectives?).

Work on buffers by the Policy and Program Division has been slower than that of the Regional Office in Aurora (Central Region, now Southern Region) (OMNR, 1987, Riley and Mohr, 1994), and the Greater Toronto Area Branch (Maple District) (OMNR, 1991a,b) However, the former Fisheries Branch did create timber management guidelines with a buffer based on slope (OMNR, 1988b), and most recently the Aquatic Ecosystems Branch has coordinated the creation of Guidelines for "Natural" Channel Systems (OMNR, 1993) Loftus (1995) comments that the issue is one of time and work load at the Aquatic Ecosystems Branch. If guidelines or research required by the Regions or Districts are not being done by the Branch, they are free to interact with the Science and Technology Units and create their own guidelines or undertake research.

Regional Office leads the planning and development in the Region by developing strategic land use and resource management plans for the region, and approving plans for each area Regional Office also supports Area Teams by providing information and advice on resource management issues, and developing and transferring science and technology applications. Southern Region also has the Conservation Authorities Section which deals with the Conservation Authorities in the province. It is through this Section that grants are provided to the Conservation Authorities to undertake resource management projects, including projects such as watershed planning, erosion control projects, and conservation.

The primary roles of the District Office are program delivery, local issue management, and providing support and public services. This is accomplished through Area Team program delivery. The District Office also provides general administrative support for the Area and Regional offices, and central services for program delivery functions and business systems common to Area, District, and Regional offices (OMNR, 1994b). Thus, any buffer programs developed would be delivered through the District offices.

Along with the District functions, the Area Teams have several important functions. These include data collection and assessment of ecosystem health to support planning activities. The Teams also develop and implement resource management plans, such as fish stocking, reforestation, wildlife habitat improvements, public awareness programs, and compliance programs. Public involvement is also sought in the decision-making process, ranging from working with special interest groups to public meetings. The Area Teams also provide public services, including technical advice on management issues, the granting of permits, and providing information on ministry programs. The District and Area Teams have also had the

role in the past for determining wetland buffers as part of their responsibility for the Wetland Policy Statement of the Planning Act.

Structures

The Ministry of Natural Resources is divided into major groups, with the current structure dating from 1994. The ministry has the Minister's office, the Deputy Minister's Office, four divisions (Operations, Policy and Program, Information Resources, Corporate Services), and the Forest Industry Action Group Each Division or Group is headed by an Assistant Deputy Minister. Each Division is divided into Branches, each dealing with a specific management focus for the ministry

For riparian buffer zones, the most applicable Branch in the Policy and Program Division is the Aquatic Ecosystems Branch. The Aquatic Ecosystems Branch is concerned with the relationships among water-based organisms and their habitats This Branch deals with fisheries, watersheds, shorelines and habitats, water management, and policy development and transfer. This Branch has also looked at guidelines for natural channel systems (OMNR, 1993).

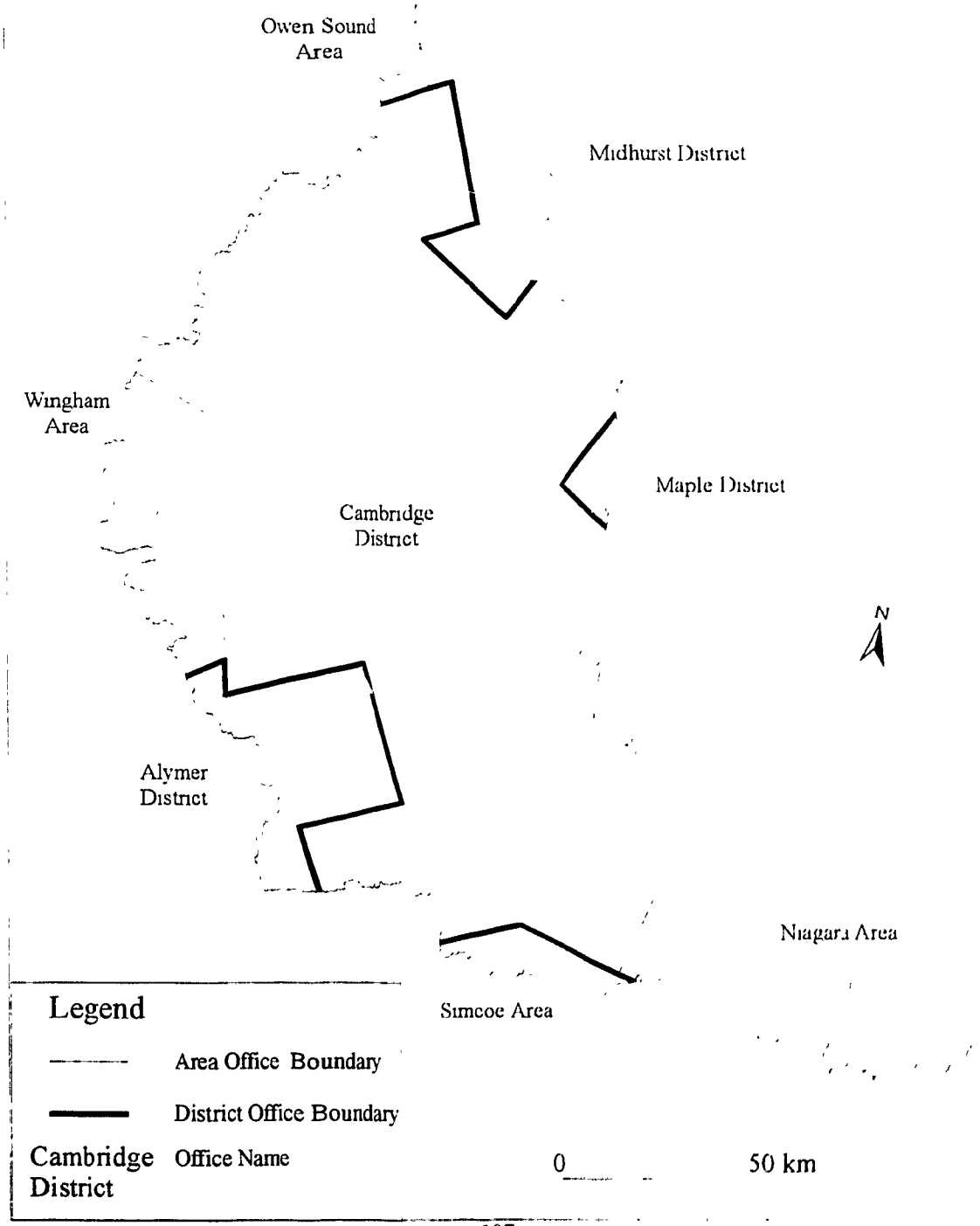
For program delivery, the ministry has developed a decentralized organization of regional, district and area offices. Program delivery is based upon 136 resource management areas that are the responsibility of units of staff (Area Teams). These Area Teams are organized into twenty-nine district and twenty-two area offices (reporting to District Offices) distributed among four regions: Northwest Region, Northeast Region, Central Region, and Southern Region. All of southern Ontario is located within the Southern Region The Grand

River watershed is divided by four districts and a number of area offices (Figure 5.2), creating boundary problems which necessitates an integrated management approach. In addition, within Southern Region is located the Conservation Authorities section that is responsible for the thirty-eight Conservation Authorities in the province.

Processes and Mechanisms

The OMNR has several linkages to other institutions. The most notable links are to the Conservation Authorities (GRCA) through program approval and funding. These two agencies work closely together on buffers, and are the primary agencies that recommend buffer creation. This has been the result of Planning Act responsibilities of the agencies, with the OMNR responsible for the Wetlands Policy Statement, and the GRCA (Conservation Authorities) responsible for the Flood Plain Planning Policy Statement, both requiring setbacks from the wetland or watercourse. These setbacks may or may not result in the creation of vegetative buffers. The Conservation Authorities also were behind the OMNR natural channel system guidelines according to Minshall (1995), and Dave Cooper (Senior Planner, OMNR Cambridge District) states that the GRCA and the OMNR are the agencies normally requesting buffers. The OMNR also assists municipalities by advising appropriate buffer design. Links to other agencies for buffers, such as to the MOEE and the OMAFRA, require improvement as links do not exist, or are limited. Links to the MOEE are non-existent, as Cooper (1994) notes that locally they have not requested buffers, although both OMAFRA and MOEE provided input and/or contributions to the natural channel systems guidelines (OMNR, 1993). The buffers created in the past through OMAFRA, such as the demonstration sites under the

Figure 5.2 Ministry of Natural Resources: Administrative Districts and Areas



Permanent Cover Programs, did not involve the OMNR, although the Conservation Authorities were involved.

Organizational Culture and Attitudes

Part of the culture is the perspective of the OMNR as the lead conservation group in the province This claim can also be made by Conservation Authorities. However, the question of scale is important. The traditional focus of Conservation Authorities has been surface water management, for which the watershed is an ideal management unit. Buffers are primarily used for water management purposes, although secondary uses, such as wildlife corridors, are possible. Wildlife management is a major focus of the OMNR through programs and statutes, and is difficult to manage wildlife on a watershed basis. As Cooper, Loftus and Art Timmerman (District Biologist, OMNR Cambridge District) all note, wildlife does not adhere to a watershed boundary, and a larger management unit, such as a bioregion, may be more appropriate (Cooper, 1994; Loftus, 1995).

Part of the organizational culture is the lack of interaction within a District Office. Cooper states that personally he has not seen much contact between the Area Teams (usually based upon a County or Regional Municipality) within one District, or within the same watershed (Cooper, 1994) Timmerman (1995) agrees with this, commenting that unless directed from above, the Area Teams go their own way. However, both Cooper and Timmerman see coordination occurring on cross-boundary issues, such as subwatershed studies, that cross the Area Team boundaries. For example, Cooper (1995) cites the Mill Creek study lies partly within the Region of Waterloo but is mainly within Wellington County,

thus the Wellington Area Team leads the Ministry's perspective on that project Links concerning buffers are also absent between the OMNR and OMAFRA at the local level, as Cooper (1994) is unaware of any links, and Harvey Wright (Soil and Crop Advisor, OMAFRA, Waterloo Field Office) has no links with the OMNR on buffers, as his contact with the OMNR mostly concerns gravel pit rehabilitation to agricultural purposes

There is little contact and coordination between and among agencies where buffers are concerned. In addition to the lack of contact with OMAFRA on buffers, Timmerman (1995) notes that there is no contact with the MOEE on buffers (at least locally), a situation confirmed by Cooper (1994) However, the GRCA and the OMNR work closely together, and are coordinated on wetlands, according to Timmerman (1995) through a protocol stating that provincially significant wetland EIS's are lead by the OMNR and locally significant wetlands EIS's are lead by the GRCA. Cooper believes the best way to deal with the lack of contact and coordination is through joint planning exercises, like subwatershed plans, that bring all the agencies and municipalities together to learn the needs of the system and the stakeholders can buy in to a joint management approach for a watershed (Cooper, 1994) This approach is useful within the Grand River watershed where support exists locally from municipalities (especially Region of Waterloo and Wellington County), the GRCA, and the OMNR for subwatershed plans. In contrast, Cooper cites that in the Niagara Region, where subwatershed plans are not used, the Conservation Authority has not pushed for them, and political support is absent (Cooper, 1994).

The current difficult economic times and financial constraints all impact upon culture and attitudes. The constraints reduce the ability of the offices to function. Cambridge District

staff were told to operate cautiously, and conservation officers have had routine patrols restricted (Terol, 1994). Added to this is the fear of job security. This all affects morale and the attitude of employees towards their jobs. Despite these recent cutbacks, Cooper would personally like to see the Ministry's monitoring role increase as Ministry staff become available due to the Planning Act changes. This role would involve provincial policy compliance monitoring of municipalities. However, Susan Duke (Director of Administration and Planning, Wellesley Township) doubts the changes will free up Ministry staff, but if it does, the OMNR would probably do an effective job Yet, Duke (1994) cautions that the greater the spatial area for monitoring, the less effective monitoring will be, especially the spatial range to monitor a complete watershed, such as the Grand River.

Summary

The OMNR views itself as the lead conservation agency in the province, a role that includes buffers as part of the conservation effort. The ministry is responsible for many statutes that influence buffers, especially the Fisheries Act. Fisheries and wildlife are the OMNR focus, and the focus has traditionally been upon the Crown Lands of northern Ontario. The ministry has undertaken research and published guidelines on buffers (OMNR 1987, 1988b), as well as on the planning of stream corridors and natural heritage systems in which context buffers must be considered. The OMNR is a major supporter and promoter of buffers, especially as part of the wetlands regulatory function, and watershed planning. Strong links exist to the GRCA at the local delivery level and through the Aquatic Ecosystems Branch which is responsible for Conservation Authorities. However, links with the other ministries for buffers, namely the

MOEE and OMAFRA, need improvement as they are virtually absent Fiscal restraints have affected local OMNR offices for management and enforcement functions

5.2.3 Ontario Ministry of Environment and Energy

The Ministry of Environment and Energy (MOEE) was created in February 1993 with the amalgamation of the Ministry of Environment and the Ministry of Energy

Legitimation

The mandate of the ministry is "to protect the quality of the natural environment so as to safeguard the ecosystem and human health, coordinate the government's energy supply and demand-related activities; and foster the efficient use and conservation of resources" (MOEE 1994b). To achieve its environmental mandate, the ministry applies two principles The first is the use of an Ecosystem Approach, which involves consideration of air, land, water and living organisms, along with their various interactions, when making decisions Other considerations include cumulative effects, the interdependence of ecosystem components upon one another, and the interrelationship among economic, social, and environmental concerns The second principle is Environmental Protection. This principle views prevention as the first priority Minimizing the creation of pollutants is second. However, when the creation of pollutants cannot be avoided, the priority is to prevent the release and second to minimize the release

Environmental protection is a strong mandate of the MOEE As the ministry responsible for the Environmental Protection Act, the MOEE has a broad mandate for environmental protection, with the purpose of the Act being "to provide for the protection and

conservation of the natural environment" (Environmental Protection Act, S.3) With this statutory mandate, the MOEE could claim the role as the lead conservation agency.

A second Act relevant to buffers is the Environmental Assessment Act that requires an assessment of the environmental impact of projects receiving public funds. In this respect, the statute is limited, as it does not apply to private projects. For buffers it would be one means to determine a site appropriate for a public buffer project.

The most notable program that the MOEE has relevant to buffers is the Clean Up Rural Beaches (CURB) program The applicable component of the program is for watercourse fencing which permits farmers up to 75% of the cost of implementing fencing along streams to keep livestock out of the watercourse Included in this is the eligibility of vegetation and tree planting between the fence and the watercourse, with plant material, fertilizer and herbicide costs limited to a maximum of fifty percent of the project cost According to Christine Shantz (Environmental Technician, GRCA) the size of the resulting vegetative buffer (if so chosen) is a minimum of eight feet from top of bank as determined by the local committee, although she notes that the standards for setbacks vary across the province (Shantz, 1995) This program is limited for buffer creation in that it must occur in existing pasture areas, or areas to be used for pasture by project completion.

Structure

The MOEE has a Watershed Management Section involved with impact assessment of urban and rural runoff of rivers, the development and the evaluation of control and abatement strategies on the watershed and subwatershed basis, and provides guidance on integrated

watershed planning approaches for protecting and enhancing river quality The existence of a MOEE Watershed Section would appear to duplicate the Conservation Authorities However Lorrie Minshall, (Manager of Watershed Resources Planning, GRCA) suggests this is not the case, but the Authority and the Watershed Section do work closely together, citing her recent attendance at a MOEE Science and Technology Branch workshop as an example of the contact between the two agencies, and the GRCA administration of the CURB program in the watershed for the MOEE Minshall (1995) also notes that the MOEE Science and Technology Branch plays a different role than the Conservation Authorities by preparing provincial policy guidelines based upon research. The MOEE is also not directly involved in local watershed planning, however, the Branch keeps informed by communicating with those people regularly involved in the planning. Additionally, contact is made through the CURB program, as the GRCA keeps the MOEE program administration informed through small ancillary projects and reports, and reports to the CURB program administration of what is being undertaken, and the positive aspects (especially water quality) to support the continuance of the program (Shantz, 1995). Also, while the local CURB committee recommends projects, it is the MOEE that gives final approval.

For buffers, the MOEE has not had an impact. Despite the role of buffers in non-point pollution control, Dave Cooper (Senior Planner, OMNR Cambridge District) has not seen the MOEE request a buffer along a stream corridor; as he states these are normally requested by the GRCA or the OMNR (Cooper, 1994)

Processes and Mechanisms

One potential mechanism for coordinating environmental policies and actions is the MOEE's Environmental Bill of Rights Act (EBR). The purpose of the EBR is to protect, conserve and where reasonable, restore the integrity of the environment by the means provided in the EBR Act; to provide sustainability of the environment by the means provided by the EBR Act, and protect the right to a healthy environment (Environmental Bill of Rights Act, S.2) Under the EBR, an Inter-ministerial Committee is created with one purpose being to "foster continual dialogue on the development and application of the Statement of Environmental Values" for the ministries (Gill, 1995). The EBR provides a potential forum for discussing and developing applications for the environmental values. Buffers are advocated by a number of the ministries affected by the EBR, thus this forum could be used to create a common policy or strategy for buffers.

Organizational Culture and Attitudes

Although the ministry should be an actor for buffers, the ministry is notable for its absence. At the field level, notably in the Cambridge District office (which comprises much of the Grand River watershed), Chris Gosselin, Manager of Environmental Planning for the Regional Municipality of Waterloo, feels the staff are invisible to the point of irrelevance. He has found it a problem to contact the people at the Cambridge office over the years, either in person, or over the telephone (Gosselin, 1994). In many cases, the ministry representatives who the Region of Waterloo deal with are from Regional Office in Hamilton, although the role of the District Office is to assist municipalities. Even for the CURB program, the MOEE local

committee representative is from Hamilton (Shantz, 1995) For buffers, Cooper (1994) also echoes that the MOEE is lagging, since in the time he has been with OMNR Cambridge District, he has not seen the MOEE request a buffer locally, and Timmerman (1995) states that there is no contact.

The MOEE's primary interest in watershed planning is non-point pollution control for water quality improvement to meet the Ontario Water Quality Objectives Although assumed, Cooper is unsure if these objectives consider the water quality requirements for fish species (Cooper, 1994). If they are not compatible, correction should occur at higher levels in the Ministries. This example reveals the lack of specific information within a ministry, and between ministries This could be partially resolved with closer inter-ministry contact at the local levels between the OMNR and MOEE.

Summary

The MOEE is notable for its absence rather than presence regarding buffers While buffers are a BMP for controlling non-point pollution, a mandate and interest of the MOEE, the ministry has not been active in buffer creation. While the ministry's CURB program can consider buffers, it is an indirect support for buffers and is limited to areas of livestock grazing At the local level, the MOEE is virtually absent, as the CURB program is administered by the GRCA. At higher ministry levels, the EBR creates an Inter-ministerial Committee that could be used to coordinate a common response for buffers

5.2.4 Ontario Ministry of Agriculture, Food and Rural Affairs

One of the oldest components of the provincial government, agriculture still retains an important role in the province for policy development. The Ontario Ministry of Agriculture and Food (OMAF) dates from 1972. In 1994 the name was amended to include Rural Affairs (OMAFRA) to reflect the role of the ministry in rural communities, not just to the agriculture and food industry.

Legitimation

The ministry is legitimated through the Ministry of Agriculture and Food Act The ministry operates according to its strategic plan, Common Ground Update, that outlines the Ministry's mandate and mission "to foster an economically viable, environmentally sustainable agriculture and food system where the participants cooperate to meet the needs of the people of Ontario and to compete in global markets" (OMAFRA, 1994). The use of Best Management Practices (BMP's) is desired to help protect the ecosystem, and the wise use of resources ensures a sustainable food system for the future. To achieve the ministry's mandate, eight strategic directions have been identified, including environmental sustainability. The ministry is responsible for developing programs and initiatives to implement this broad policy. The ministry is also responsible for a variety of statutes related to the agri-food industry and rural affairs. Many of these concern economic or regulatory functions, such as licensing, although a few are relevant to the environment.

One statute influencing naturalized riparian buffers is the Weed Control Act. This statute dictates that every person in the possession of land must destroy all noxious weeds

located on such land. Area weed inspectors are appointed through by-law by upper tier municipalities, with failure to appoint resulting in inspectors potentially being appointed by the minister. Lower tier municipalities also can appoint municipal weed inspectors, although the area inspector has the ultimate authority. Municipal councils also can designate through by-law a local weed or plant that is not identified provincially as a noxious weed and so approved by the minister. Once approved, these plants or weeds are considered the same as a noxious weed. Inspectors have the power to order the person in possession of land containing noxious weeds to destroy the weeds and weed seeds. Failure to do so could result in the inspector destroying the weeds at the land owner's expense, with contraventions of the Act and regulations subject to a first offense fine of $500 - $1000, and $1000 - $5000 for subsequent offenses. These regulations are a major impediment during buffer establishment Naturalization takes time, especially if native grasses are desired and used These grasses take longer to establish than domesticated forage grasses. In the establishment period, weeds can become a problem, which could be an issue if neighbours complain of the weeds spreading to their property. This may require mowing of the buffer, retarding natural succession, or the undesirable use of pesticides.

A second relevant Act is the provincial Agricultural Rehabilitation and Development Act. This statute allows the minister to enter into agreements with the federal government to undertake joint projects for the development and conservation of water supplies for agricultural purposes; or for soil improvement and conservation to improve agricultural efficiency Projects promoting buffer zones would qualify within the criteria for water supply conservation, and soil improvement and conservation. The minister may also initiate research on water supply

conservation and for soil improvement and conservation in Ontario independently, or jointly with federal cooperation. Although such programs have not been undertaken for buffers in the past, they do provide a method through which improved and needed research for buffers could be conducted.

In addition, the Drainage Act is a statute that could have an impact upon the establishment of buffer zones. Under the Act, petition drains may be created that are maintained by the municipality at the expense of all the upstream lands and roads that are assessed by the Engineer's Report as deriving a benefit from the drain The main issues for municipal drains are maintenance and drain access for maintenance. If the owner obstructs a drain, the municipality may remove the obstruction at landowner expense, thus a buffer established by the land owner may be a land owner liability rather than a benefit, thereby deterring buffers on municipal drains. In the event that a landowner establishes a buffer and it is subsequently destroyed by municipal maintenance, the municipality is not responsible for restoring the buffer unless the buffer is identified in the Engineer's Report. Only two municipal drains in Ontario have buffers identified in the Engineer's Report.

Functions

The primary environmental function of the ministry is to assist landowners with information and financial aid. The ministry's information regarding environmental matters is met through Fact Sheets and a booklet series called Best Management Practices. Linked information provision is education and advisory support, with the technical support provided by the Resources and Regulation Branch. For land owners, according to Peter Roberts

(Resource Management Specialist, OMAFRA: Resources and Regulations Branch), it is generally the local Soil and Crop Advisors who provide extension services through problem identification and recommending solutions (Roberts, 1995). Harvey Wright (Soil and Crop Advisor, Waterloo Field Office, OMAFRA) agrees, noting that for farmers wishing to undertake conservation initiatives, he as the Soil and Crop Advisor is usually an initial contact (Wright, 1995).

The ministry is also influential in the Environmental Farm Plan (EFP) program Designed by farmers, the EFP originated in a grassroots style from the farm community through the Ontario Farm Environmental Coalition. Financial aid for the program comes mainly from federal sources, with Agriculture and AgriFood Canada having committed $3.9 million of federal Green Plan funds over a four year period (1994 - 1998) to deliver the EFP, and a $5.7 million EFP incentive program provides a maximum $500 per farm business (Ontario Farm Environmental Coalition, n.d. a) The program is delivered through the Ontario Soil and Crop Improvement Association with technical assistance provided by OMAFRA Worksheets 21 and 22 of the EFP evaluate buffers, with the goal, according to Roberts (1995), to have farmers move into the good and best buffer categories

The ministry also develops partnerships. In many cases the ministry is not directly involved in program delivery, but delivers programs through NGO's The most recent examples include the Land Stewardship Program funded by OMAF, and the National Soil Conservation Program (Permanent Cover I and II), funded by Agriculture Canada, with both being administered by the Ontario Soil and Crop Improvement Association.

Structures

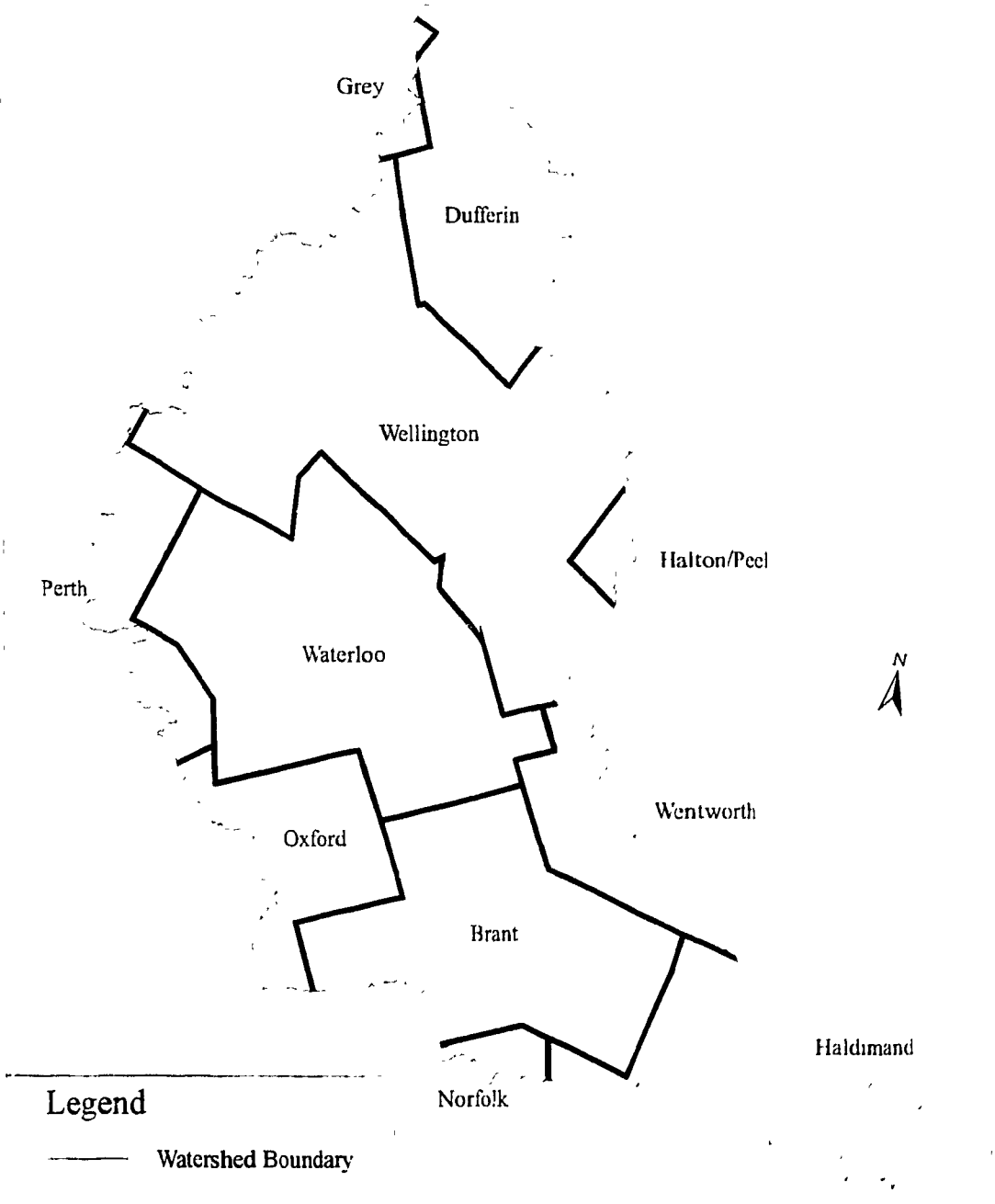
The Ministry of Agriculture, Food and Rural Affairs is organized into several Divisions, with environmental matters primarily dealt with by the Agricultural and Rural Division. As part of this Division, the Resources and Regulations Branch provides expert support for the ministry, other agencies, farm organizations and farmers on aspects related to engineering, drainage, soil, and water management. They also provide assistance on matters related to the environment and weeds. This branch also administers and supports regulations, and assists in policy development for the relevant and applicable legislation. This Branch also administers both the Drainage Act and the Weed Control Act.

For field service delivery, the province is divided into four regions. These four regions comprise fifty-two field offices, with eleven located in the Grand River watershed (Figure 5.4). Many of these field offices are still based upon the traditional county structure, although this is changing as offices are being consolidated. For example, Halton and Peel have been merged and plans are underway to merge the Wentworth and Brant offices.

Processes and Mechanisms

The most influential mechanism for integration is the creation of partnerships with other ministries and NGO's for program design and implementation. As noted, many environmental programs are operated in cooperation with other ministries or agencies. In the Grand River watershed, environmental programs and environmental planning are undertaken in cooperation with the GRCA in the Region of Waterloo, with demonstration projects on Beaver Creek demonstrating Best Management Practices, including buffers. Wright (1995) notes that

Figure 5.3 Ontario Ministry of Agriculture Food and Rural Affairs Field Offices



his involvement is limited to recommending forage seeding, and is not actively involved in hands on project participation. Wright also notes that his involvement in the Permanent Cover Programs involved sitting on committees and project approval, but not actual project implementation, although he did visit three farms on follow-up visits where problems were experienced (Wright, 1995). At the local level, Wright states that he has some links to the GRCA, especially through Charlie Roland (Soil Conservation Technician, GRCA), and that contact is generally good. However, Wright notes his contact with the OMNR has not concerned streams, but instead much of his contact concerns gravel pit restoration to agricultural use. Similarly, Wright has not had contact with the MOEE on streams, as his contact with the MOEE has mainly concerned pesticides and the enforcement/regulation aspects of pesticides (as part of the MOEE mandate under the Pesticides Act), especially for situations such as identifying pesticide drift and crop damage (Wright, 1995).

A main focus of OMAFRA is public participation. Through a heavy reliance on voluntary stewardship rather than regulation, OMAFRA believes the public can be slowly brought onside to protect the environment not through force, but persuasion. Andy Graham of the Ontario Soil and Crop Improvement Association, who has been involved in the delivery of numerous incentive programs, believes that education and volunteer action needs to be given a greater chance and fostered through incentive programs. Like any other industry, Graham suggests that targeting policy and regulation at the farm community will lead to animosity and rebellion, and therefore, accelerated education and incentive programs are required (Graham, 1994). Ted Taylor of the Ministry's Resources and Regulations Branch agrees, favouring targeted extension programs instead of legislation. This also reflects the attitudes of the farm

community, as the Ontario Farm Environmental Coalition believes the principle that "the more successful approach to encouraging land and environmental stewardship will involve education, individual initiative, and encouragement of the environmental ethic" (Ontario Farm Environmental Coalition, n.d., b). With information and technical assistance, it is believed by OMAFRA and agricultural NGO's that landowners will undertake stewardship initiatives as educated and informed agricultural communities are likely to adopt environmental initiatives themselves. The EFP is an example of a grassroots environmental initiative originating from the agricultural community. This process is being effective in practice, as Graham states that 2,500 farmers have already been put through the voluntary EFP process, with a target of 14,000 by March 1997 (Graham, 1994).

Organizational Attitudes and Culture

The OMAFRA reflects many of the attitudes held by the agricultural community and rural areas in general. According to Taylor (1994), Graham (1994), and Roberts (1995), the main emphasis of program delivery is on a private stewardship approach, stemming from the organizational attitude that the land owner is the best steward of the land and that farmers are generally good stewards. This attitude is also evident in program delivery that relies on voluntary participation rather than forced compliance. This attitude is best summed up in "Regulation is no substitute for the farmer-helping-farmer approach to environmental responsibility..." (Ontario Farm Environmental Coalition, n.d. b)

The ministry also reflects a sensitivity to the agricultural community in recommendations on environmental matters, including buffers While the recommended buffer

width has varied over the past decade from a minimum five to three metres, the premise remains the same: the more land dedicated to environmental protection, the less land for agricultural production, and hence decreased financial return to the land owner. Therefore, the ministry recommends minimum distances to persuade farmers to implement buffers and not to intimidate them by wide distances.

Agriculture is a business and this is strongly reflected in the organizational culture and structure of the ministry. Many of the divisions and branches deal with the financial side of agribusiness, with the environmental aspect relegated to a minor role dealt with by the Resources and Regulations Branch as only a portion of its mandate. This minor position is despite the tremendous impact that agricultural activities can have upon the environment, both from actual activities and the vast spatial area that agriculture occupies in southern Ontario. Although environmental sustainability is a pillar of the OMAFRA strategy, according to Roberts (1995) there are only four or five people in the Resource Management Branch concerned with the environment. While Roberts has noted that much of the environmental extension services are provided by the local Soil and Crop Advisors, Wright comments that the provision of this service is limited due to time constraints, as environmental functions, such as monitoring previously installed buffers, are only one component of his responsibilities. Wright's primary focus has been on providing crop extension services to farmers and since this is a large request on the part of farmers, much of his time is spent in this capacity (Wright, 1995).

The environment is receiving a higher profile in the ministry. In cooperation with Agriculture Canada, the OMAFRA has been providing information projects to the agricultural

community, the most notable being the Best Management Practices series of booklets These booklets have been released since 1993 on a variety of topics, with discussion of buffers notable in the Farm Forestry and Habitat Management booklet (OMAF, 1993), and the Water Management booklet (OMAF, 1994). The ministry has also undertaken participation in the Environmental Farm Plan program. It is a voluntary program providing farmers with an opportunity to increase their farm environmental awareness, and identify environmental strengths and weaknesses of their properties As a result, land owners can set goals and objectives to improve conditions that require attention.

Summary

The OMAFRA is an agency that prefers to play an indirect role in buffer creation The ministry recognizes the importance of buffers as a BMP and encourages their use through extension services and the EFP's. In this respect, the ministry prefers private stewardship initiatives rather than legislation. The legislation at the ministry's disposal includes the Weed Control Act, that impacts buffer management through naturalization, and in this respect can be a problem or barrier to buffer creation. The ministry has few links to other ministries, and for buffer these links should be established or strengthened.

5.2.5 Ontario Ministry of Municipal Affairs

The Ministry of Municipal Affairs has an indirect, yet important role in buffers

Legitimation

The Ministry is responsible for municipalities under the Municipal Act, and is also responsible for the administration of the Planning Act, which controls land use planning decisions in the province. This Act has been revised with the passage of Bill 163 (Royal Assent December 9, 1994), which incorporated several of the recommendations of the Commission on Planning and Development Reform in Ontario, also known as the Sewell Commission (Commission on Planning and Development Reform in Ontario, 1993). Among the key changes is an increased recognition of the environment in land use planning decisions, as evident in the new Natural Heritage, Environmental Protection and Hazard Policies. A second key change is devolution of land use planning power from the province to municipalities if municipalities are consistent with the provincial policy statements. This is designed to give communities greater control over their environment while reducing the delays created by provincial agency plan review

One notable omission in Bill 163 is the mention of a watershed approach to land use planning. While the initial consultation paper recommended that municipalities should "adopt policies and designations based on watershed considerations for matters of development and change affecting water.." (OMMA, 1993: 16), this policy was removed from the subsequent Comprehensive Policy Statements (OMMA, 1994a), as was the statement that municipal plans be coordinated with adjacent municipalities. Although the term watershed planning has been removed from the policy statements, the term is still implied. Goal One of the Natural

Heritage, Environmental Protection and Hazard Policies (Goal A1 of the Comprehensive Policy Statements) is "to protect the quality and integrity of ecosystems, including air, water, land, and biota; and, where quality has been diminished, to encourage restoration or remediation to healthy conditions" (OMMA, 1994a: 1). To accomplish this goal, studies to determine the form and function of the ecosystem will have to be undertaken, which in essence, is watershed planning.

For riparian buffers, no direct reference is made in the policy statements Instead, buffers are defined within the context of corridors. Regarding Goal A1 of the policy statements and related definitions, corridors are defined as.

> the naturally vegetated or potentially revegetated areas that link or border natural areas and provide ecological functions such as habitat, passage, hydrological flow, connection or buffering from adjacent impacts. They can occur across or along uplands, lowlands or slopes. Ravine, valley, river and stream corridors are further defined as landform depressions, usually with water flowing or standing in them for some period of the year Ravine and valley corridors may be defined locally by considerations such as their natural features or functions, minimum setbacks from the crest of slope, top of ravine or valley bank or top of projected stable slope (OMMA, 1994a: 27)

Thus, in the policy context, buffers are significant in the protection of ecological form and function from adjacent land use impacts. Development, in its many definitions, is generally prevented in corridor areas, with an Environmental Impact Statement (EIS) required within 120 metres of a wetland. However, agriculture is not considered development.

The mandate of the OMMA is "to enable communities and municipalities to meet the needs of the residents of Ontario and to plan for the future" (MOEE, 1994c). Accompanying this mandate are strategic directions and objectives, including a Good Planning direction. Under this direction are two fundamental objectives. The first is "ensuring the long term

interests of the residents of Ontario by fostering land use planning which integrates environmental, economical and social considerations" (MOEE, 1994c). Second, is "formulating integrated provincial/area planning initiatives to guide communities in their development and coordinate provincial interest in land use" (MOEE, 1994c).

The environmental role of the OMMA is concerned with the following aspects: municipal government powers and structure, working with other ministries; integrated/area planning initiatives; and land use planning legislation and associated polices. Under the Municipal Act, the OMMA is responsible for defining the roles, responsibility, and authority of municipal governments and the division of power between the lower and upper tier municipalities. For environmental concerns, the OMMA's role is to ensure that municipal structures and powers are adequate to protect local environments, and to fulfill the provincial environmental requirements that affect them (MOEE, 1994c).

In working with other ministries, the OMMA maintains a role of helping to shape the environmental initiatives developed by other ministries affecting municipalities so that the initiatives are sensitive to the capabilities and role of municipalities in local governance (MOEE, 1994c). This is an important function so that initiatives are not implemented in a draconian fashion, but that the needs, capabilities and resources of the local municipalities are considered. This allows problems to be dealt with proactively. This would allow any formal program affecting municipalities for buffer creation, either as policy or financial incentives, to be dealt with. An example would be a property tax break for buffers.

For integrated/area planning initiatives, the OMMA undertakes initiatives integrating the concerns of several ministries. These initiatives can focus on specific issues, or upon

geographic areas. The ministry must ensure when developing these initiatives that they incorporate provincial policy interests, thus the OMMA views itself in this respect as an integrating lead agency.

The ministry also has an environmental role in land use planning The ministry is responsible for developing land use planning legislation and policy statements, and making decisions on land use planning applications. This functional role is to ensure that legislation for municipal land use planning enables the province to secure desired environmental interests, and that policy statements and decisions on land use planning applications incorporate provincial environmental interests.

As one of the ministries mentioned within the Environmental Bill of Rights Act, the OMMA has prepared a Statement of Environmental Values (SEV) The SEV applies to the decisions of the OMMA, not to decision making by municipalities. As part of the EBR, the OMMA uses a set of nine environmental guiding principles and seven integration and implementation principles in decisions significantly affecting the environment Thus, the adoption of a buffer policy by the OMMA would not have a direct impact upon municipalities, but if included within the Planning Act, municipalities would be subject to it. If coordinated with other ministries, a common policy could be adopted through the Inter-Ministerial Committee that would cover the applicable provincial agencies, and municipalities indirectly through the OMMA and Planning Act. According to Usman Ahmed (Senior Planner, OMMA Provincial Planning Policy Branch), the ministry SEV does not reflect ministry policy as such, but rather outlines the principles by which the OMMA conducts itself in formulating initiatives of environmental significance (Ahmed, 1995). The ministry is developing processes to ensure

consistent EBR application across the ministry for matters of environmental significance (Ahmed, 1995).

Structure

The ministry maintains a traditional structure of provincial level branches and divisions and a field level service delivery system. For environmental planning and buffers, the Provincial Planning Policy Branch is most relevant in providing policy direction. The aim of current planning policies is to provide a general objective, while leaving implementation strategies to the local level. This allows municipalities to deal with local circumstances and concerns. Thus, a buffer policy could be a general provincial policy with implementation details for buffers, such as composition and width, determined at the local level based on local conditions.

Functions

The OMMA is responsible for a number of functions. Under the Municipal Act, the ministry is responsible for creating municipalities and associated geographic boundaries. The ministry also establishes the power for the municipalities. Some of these powers are further defined in specific provincial statutes.

The ministry also plays the functional role of facilitator for the municipalities. In this role, it can resolve cross-boundary issues that cannot be solved by the municipalities involved. Thus, the ministry acts as a dispute resolution mechanism.

The OMMA also functions as an approval authority. Municipalities are required to create Official Plans that must be approved by the ministry, which has the power to modify

these plans. Yet, the most important ministry function for environmental issues is the creation and maintenance of policy for use by the municipalities through the Planning Act. In this role, the ministry's function is important and critical, especially for creating consistency in land use planning across the province.

Processes and Mechanisms

Perhaps the most important mechanism that the OMMA provides is the Ontario Municipal Board (OMB) Established under the Ontario Municipal Board Act, the OMB is an administrative tribunal responsible for hearing appeals and deciding various contentious municipal matters, including land use planning. Consisting of members from various backgrounds, the Board is appointed by the provincial Cabinet. The OMB serves as an informal court of law with the main role being to hold public hearings on land use planning issues and planning applications. Except when a matter of provincial interest has been declared, the OMB has the final say in all community planning decisions in the province which have been appealed or referred to it.

An important process created by the revised Planning Act. is the greater municipal empowerment if consistent with the provincial policy statements. These general policies emphasize desired ends to be achieved rather than prescribed procedures to achieve them This allows municipalities to adopt an approach to local conditions and circumstances rather than being required to use a standardized planning approach.

Organizational Culture and Attitudes

The OMMA considers itself a lead integrated planning agency, as evident in the Ministry's Strategic Directions document (OMMA, 1991), and in its role of land use planning in the province through the Planning Act policy statements. While this is true, the OMMA is not the best agency to lead riparian buffer zone creation, based upon the indirect role of the Ministry concerning buffers.

In terms of receptivity to change, the OMMA is very responsive. This is evident with Bill 163 making significant changes to the Planning Act. Part of the changes involves a devolution of power and control from the Ministry to the municipalities. For some municipalities, such as the Regional Municipality of Waterloo, they acquire essentially ministerial approval for lower tier plans once the Region's Official Plan (Regional Official Policies Plan) is approved by the province. Thus, the OMMA is supportive of a cooperative management framework. The ministry is not concerned about a loss of power that may occur through integration. This attitude is evident in the Ministry's strategic directions document, Progress Through Partnerships (OMMA, 1991).

Summary

The OMMA has an indirect role in buffers through land use planning and the Natural Heritage Policy under the Planning Act, and the control of municipalities under the Municipal Act. It is through land use planning and the policy statements under the Planning Act that the ministry's role is most evident, especially the consideration of buffers within the context of corridors in the Natural Heritage Policy. The ministry favours integrated planning, and Bill 163

reflects changes in land use planning by local municipalities undertaking land use planning suited to local circumstances in a manner that is consistent with general provincial policy statements.

5.3 Municipalities

5.3.1 Regional Municipality of Waterloo

Legitimation

The Regional Municipality of Waterloo (also referred to as the Region of Waterloo) came into existence on January 1, 1973, and consists of the former County of Waterloo and part of the County of Wentworth. Created under the Regional Municipality of Waterloo Act, the Region of Waterloo is a two-tier municipality comprising seven municipalities. four Townships (North Dumfries, Wellesley, Wilmot and Woolwich) and three Cities (Cambridge, Kitchener, and Waterloo). The Regional Council adopted a new Regional Official Policies Plan (ROPP) in October 1994, and awaits ministerial approval of this plan under the revised Planning Act and policy statements.

The Region has a long environmental tradition that continues to the present with respect to buffer use. As is the case in all municipalities, the Region and municipalities are subject to financial constraints limiting new initiatives. In terms of environmental land acquisition, no longer does a municipality have funds to proactively purchase land, and when a municipality acquires land through property development, this becomes an expense to the municipality for maintenance.

Functions

The municipal functions are divided between the Region and the seven Area Municipalities. For environmental planning, the Region is empowered under the Act to prepare information for the study, explanation, and solution of problems affecting the development of the Waterloo Planning Area, and to hold public meetings and information to solicit public participation in the planning process. The Region also must create an Official Plan for the Region, the ROPP, to which the municipalities' Official Plans must conform. Under the Planning Act changes, the Region also acquires ministerial power for approving of the Official Plans for the municipalities.

Regarding planning functions, each has different roles. The municipality has the power to undertake the actual planning functions under the terms of the Planning Act, including land use planning. The Regional role is to consider the interests of the entire Waterloo Planning Area, including the collection and distribution of information, and facilitation of public involvement in the planning process. The Region also prepares an Official Plan that serves as the guiding document for the area municipalities.

Structure

As a two-tier municipal structure, there exists both a Regional Council consisting of representatives of the municipalities, and a local council for each of the municipalities. Under the Regional Municipality of Waterloo Act, all municipality Official Plans and by-laws must conform to the ROPP.

Processes and Mechanisms

Both political and bureaucratic methods exist for conflict resolution in the Region Politically, Regional Council deals with issues affecting the Region as a whole, and comprises members representing municipalities who also sit on the local councils, thereby offering a channel of communication. Regional Council is also advised on environmental issues by the Ecological and Environmental Advisory Committee (EEAC). The purpose of this appointed group is to review development applications relating to Environmentally Significant Policy Areas and other aspects of environmental interest based upon terms of reference adopted by the Regional Council.

At the bureaucratic level, the most effective linkage is communication. Barb Dembek (Director of Planning, Wilmot Township) states that if a problem occurs, planners communicate with one another. If a problem exists between Wilmot Township and Blandford-Blenheim Township, for example, Dembek will phone the Oxford County Planning Department to discuss the situation. Communication is also facilitated, according to Dembek, by a legislative requirement that development within 500 metres of a municipal boundary must be circulated to the adjacent municipality. However, Dembek was also quick to note that no great dialogue exists between Wilmot and other municipalities because there is no development along the borders. April Ionson (Senior Environmental Planner, City of Cambridge) views the situation somewhat differently. While noting that communication is easier within the Region, no formal mechanisms exist for interaction with adjacent municipalities in Wellington County Therefore, contact is based upon informal methods by knowing and communicating with staff,

but Ionson believes this contact is not as easy as within the Region because Wellington operates under a different structure (County structure).

Another informal mechanism is the Area Planners group, involving the planners of the various municipalities, however the effectiveness of this forum to discuss issues is unclear. Ionson believes this group as effective by communicating extensively on various issues across the political boundaries. By contrast, Dembek states that the Area Planners group has not been active, a sentiment echoed by Susan Duke (Director of Administration and Planning, Wellesley Township). Duke says that she is not involved in anything involving other municipalities, but believes links exist at higher levels. The Area Planners once included Wellington County, creating a broader forum on issues, but Duke is unsure if they are still part of the group. Evidently if fellow members cannot be identified, the group is not too active. This group could be used for dealing with and discussing cross-boundary issues and issues of common concern, which buffers are one such example.

In terms of consideration and coordination of environmental planning, the general direction is towards municipalities going their own directions within the policy framework of the ROPP, a view confirmed by Amedeo Spagnuolo (Director of Planning, North Dumfries Township) Watershed planning is one of the directions of the new ROPP. However, there is no requirement for direct area municipal implementation of watershed recommendations. For example Brian Trushinski (Senior Planner, City of Waterloo) cites that after the Laurel Creek Watershed Study, the City of Waterloo was quick to set up the Laurel Creek Watershed Implementation Advisory Committee comprising watershed municipalities, other governmental agencies, local developers, and citizens. This group plays an advisory role only for

implementation, by looking at what could be done, not what will be done. Trushinski suggests that for cross boundary buffers, teams comprising staff or politicians should be set up between adjacent municipalities. Spagnuolo advocates elected officials playing a greater role in integration and coordinating, such as on watershed studies, and having the official report back to staff (Spagnuolo, 1994). This represents a reverse of the current situation Unless politicians are used for coordination and integration purposes, achieving these purposes would require additional staff and time, and as Spagnuolo (1994) states, North Dumfries is run as a business, with study participation taking him out of the office and is financially costed

The impact is especially serious in rural municipalities where there is usually one planner on staff. Like Spagnuolo in North Dumfries, Duke is the only planner in Wellesley Township, and the entire municipal staff totals thirteen. It is unfortunate in Duke's opinion that involvement is minimal. For the Laurel Creek implementation group, Duke is unable to make all the meetings and there is no one else to send. At best, Duke receives and reads the minutes, and if questions exist, she finds someone to answer them In this respect, assistance by the politicians is desirable.

Organizational Culture and Attitudes

For environmental planning, the Region of Waterloo has a strong environmental ethic that dates back to the 1970's. It was the first Ontario Region to implement Environmentally Significant Policy Areas, doing so in 1976 This environmental ethic has been ingrained in the organizational culture and remains strong to this date. Efforts are also being taken to push the current limits on environmental planning by undertaking increased ecological planning though subwatershed planning, and within the Region, support for watershed planning is increasing as

more and more studies are undertaken. This is evident in the many subwatershed studies that the City of Waterloo has undertaken in response to the Laurel Creek Watershed Study, including the recently completed Subwatershed 314 in north-east corner of the Waterloo west side. The City of Cambridge is also in the process of three watershed (or subwatershed) studies. the Blair-Becthel-Bowman, Mill, and Moffat Creeks. The concept of watershed planning has been incorporated in the recent Regional Council approval of the ROPP in October 1994

The issue of watershed planning has created some potential clash of views between urban and rural municipalities. This is especially true of the Laurel Creek Watershed Study (LCWS) Primarily for the benefit of the urban development for the City of Waterloo's west side, the study involved the townships of Wilmot, Wellesley, and Woolwich, which have small portions of area in the head waters. One of the recommendations of the LCWS was the creation of buffer strips to improve water quality for the watershed. The City of Waterloo passed Official Plan Amendment Number 16 concerning development on the west side (Waterloo, 1993), creating setbacks for buffers, but many of the erosional problems are the result of agricultural operations in the rural townships which are beyond its control. While this is a problem for the city, it is not for the townships upstream from the sedimentation problems. As no development is occurring in the headwater area, buffers cannot be legally imposed. From a land use perspective, buffers can only be enforceably imposed in development situations, and despite the erosional impact of agriculture, agriculture is not deemed development within the definitions of the Planning Act. The townships question why measures should be taken in the headwater area when there is no direct or urgent need for the township

to take action, and in some cases, such as with buffers, no mechanisms exist to implement and legally enforce buffers.

Summary

The Regional Municipality of Waterloo has a major potential role to play in buffer zones. Through the ROPP at the regional level, the upper tier sets policy that is adopted by the lower tier municipalities in their official plans. Unfortunately, buffers are not included in the recently revised ROPP The municipalities also play a key role in official protection through zoning. Currently, the municipalities use the same protection designation for buffers as parkland, with buffers not specifically identified through a special environmental zoning The municipalities are also limited in what is legally implementable for buffers, given the problems of legal non-conformance, and are striving to work closer together and integrate land use planning with agencies through watershed planning

5.3.2 County of Oxford

Legitimation

As an upper tier municipality, the County of Oxford is a restructured county created under the County of Oxford Act. Oxford, unique in the province as the only Restructured County, is a hybrid between the traditional County structure and a Regional Municipality For simplicity, it is hereafter referred to as a County, although the importance of its restructuring must not be overlooked Under the Act, all planning functions for the County, except for specific sections of the Planning Act empowered to the municipalities, are undertaken by the

County The County also has one Official Plan for the entire county, which is currently being updated, with County Council scheduled for approval in June 1995.

For watershed planning, Oxford is distinctive. While many upper tier municipalities are divided by one or two watersheds, Oxford is divided by four watersheds and has parts of four Conservation Authorities Upper Thames River, Grand River, Long Point Region, and Catfish Creek (Figure 5 5) This creates problems in land use planning, as evident through the Regulatory Floodlines used by each Conservation Authority (Table 5.1).

Table 5.1 Selected Regulatory Floodlines

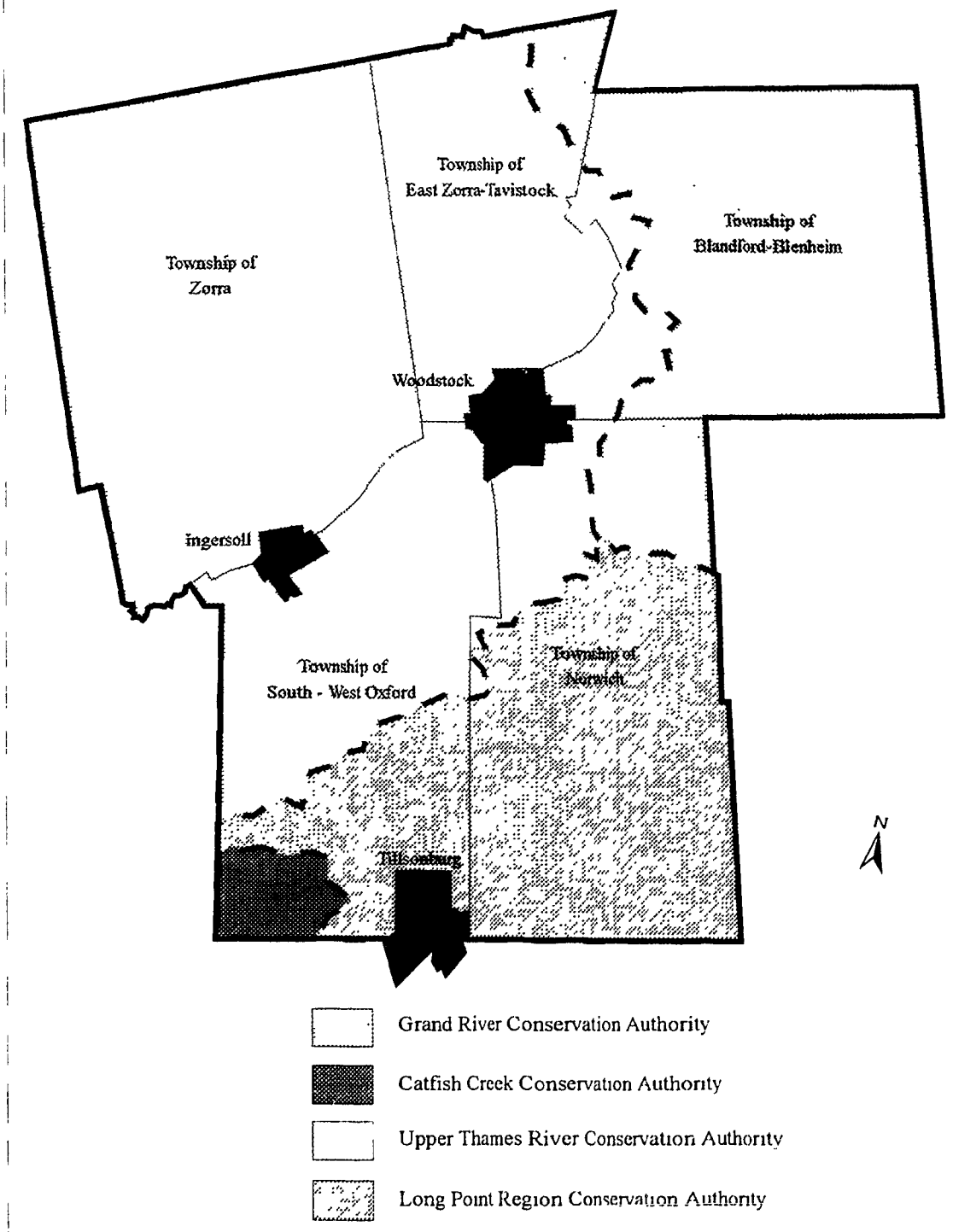
Grand River Conservation Authority	Regional Storm (Hurricane Hazel)
Long Point Region Conservation Authority	100 Year Event
Catfish Creek Conservation Authority	Regional Storm (Hurricane Hazel)
Upper Thames River Conservation Authority	Regulatory Storm (1937 Upper Thames flood)

Source County of Oxford, Draft Official Plan, p 3-86.

Two townships, the Township of South-West Oxford and the Township of Norwich, are divided by three watersheds, and as such must follow three sets of regulations depending upon property location

The new Draft Official Plan for the County contains many references to buffers and related policies The policies regarding buffers are most prevalent regarding water quality. Besides promoting the use of natural channel systems in the design of new subdivisions and retaining watercourses in a natural state by incorporating existing and new naturalized buffers, buffers are recommended for a variety of development situations. To enhance water quality, buildings and lots may have setbacks from riparian lands. This includes a setback determined from top of bank, which is consistent with OMNR practices (OMNR, 1987); the acquisition of

Figure 5.5 County of Oxford Conservation Authority Watersheds



Adapted from County of Oxford Draft Official Plan, 1994.

riparian lands and lands immediately adjacent as part of parkland dedication (zoning protection for a buffer); a requirement to retain existing vegetation and add new plantings to achieve a natural buffering corridor (County and Area municipalities may consult with OMNR and appropriate Conservation Authority in determining appropriate width); and requiring measures, such as fencing riparian areas, and restricting access from individual properties abutting riparian lands, to discourage alterations in vegetation (encroachment protection) (Oxford, 1994: 3-72 - 3-73).

In rural areas, site plan approval from the municipality may be required for new or expanding livestock operations, and for milkhouse washing and manure storage facilities. The site plan includes mitigative measures, such as adequate watercourse setbacks, fencing to prevent livestock access to watercourses, and buffer strips that may be required adjacent to watercourses and drainage systems to improve stormwater quality. Additionally, in granting rural land severances, the County Land Division Committee may impose conditions to address potential water quality concerns, including the establishment of buffers adjacent to watercourses and drainage systems (Oxford: 1994: 3-73 - 3-74).

While prominent in the water quality section, buffers are not confined to this section exclusively, as other sections include both buffers and implications to buffers. Most notably is the wetland buffer requirement, which subject to an Environmental Impact Study, may have a buffer of up to 120 metres on provincially significant wetlands (Oxford, 1994: 3-55). Buffers are also required where development or a change in land use is proposed contiguous to or within Significant Aquatic Habitat areas. After consulting with the OMNR and the applicable Conservation Authority, the County will impose minimum vegetative buffer zones as a

condition of approval. Buffers are also a requirement to mitigate stream impacts from active recreational uses, such as golf course development. The County is also supportive regarding natural wildlife corridors and linkages by preserving them and requiring linkages as a condition of development. Watercourses are one of the identified types of linkages, thus allowing a buffer to fulfill multiple mandates.

As with the Region of Waterloo, Oxford County is also supportive of watershed and subwatershed planning for integrating water and environmental management with land use planning. To this end, the Draft Official Plan contains policies for watershed planning, including participation and potential financial contributions to watershed/subwatershed studies in partnership with other institutional stakeholders; ensuring public participation in studies, incorporating study findings into the Official Plan when complete and supported by County Council; and participating in programs, initiatives and procedures to monitor the success of the plan or strategy (Oxford, 1994: 3-69). As a guide, the Draft Official Plan also specifies the minimum requirements for any subwatershed study.

Functions

The primary municipal environmental function is land use planning. In Oxford, this is evident in the Official Plan that states municipal goals, and reflects the new provincial policy statements. As such, the draft Official Plan is much greener, according to Manley (1995), than its 1979 predecessor. As part of its planning duties, the municipality controls local land use decisions, including development, that affect the environment At the local level, the area

municipalities also have responsibility for drainage under the terms of the Drainage Act and the creation and maintenance of municipal drains.

Perhaps the most crucial functions that local municipalities use are zoning by-laws that regulate land uses within the municipality and place restrictions on permitted uses. However, from a practical standpoint, zoning only stipulates what the land may be used for, not the actual activities to be practiced on the land. A large portion of the rural municipal areas under consideration in this study is zoned agricultural This designation puts restrictions on the property for permitted uses and development, but has no power to require that specific activities are undertaken, such as BMP's. While it is possible for a rural municipality to zone general buffers along stream corridors, these are not enforceable as the current use is legal non-conforming. Unless there is a land use change to the property, such as a severance or development, can a buffer be legally required.

One function in which the County may become involved is a Conservation Land Trust, proposed in the Greenspace System concept of the draft Official Plan. The feasibility of a Trust will be investigated by County Council for accepting monetary and/or land gifts for the conservation of the natural environment. If established, it is recommended in the draft Official Plan that the Conservation Land Trust be administered directly or indirectly by a standing committee of County Council with the mandate to protect natural areas.

A significant environmental function in the Official Plan is environmental monitoring and reporting. The recommendation is for baseline monitoring to establish change based upon representative indicators for air, land, and water.

Structures

Under the County of Oxford Act, the County Council has the power for planning, including the power of an area municipality, under the Planning Act, with the Area Municipalities not having any planning powers except those specified in the County of Oxford Act. Decisions on consents under the Planning Act are made by a land division committee, which may either be appointed or consist of the County Council. As a political system, it is the political decision makers that have the final say.

In a centralized planning system, the planning process is simplified relative to a two-tier municipal system. Although there are still designated planners for the individual municipalities, and as such no fewer staff, other efficiencies exist. As one planning jurisdiction, only one Official Plan must be conformed to. Unlike the Region of Waterloo, once the County of Oxford's Official Plan is approved, the process is complete In the Region of Waterloo, once the ROPP is approved, then municipalities must make their Official Plans conform, a process that can take up to three years.

Processes and Mechanisms

Several processes and mechanisms in Oxford create linkages. Politically, there are linkages between the area municipalities and the County Council For the townships, two members of the local council sit on County Council, thereby creating a conduit for information and representation between the upper and lower tier structure

At the bureaucratic level, the most important mechanism for environmental issues is a centralized planning department for the County. This provides easy communication

opportunities due to the close physical proximity, thereby creating many informal personal contacts that can be used if cross-boundary issues arise between adjacent area municipalities. Manley (1995) believes that the structure facilitates the planning process, making planning much easier to conduct. This is because it allows for better coordination between policy and implementation. In this respect, the planners who develop the policy are also responsible for implementation, whereas in a two-tier system, the upper tier develops policy and the lower tier is responsible for implementing it

An integrated approach has been recently utilized in Oxford concerning a study of the Brick Wetlands in Woodstock. This study involved three agencies, landowners, city departments, and the County Planning department. Manley describes the process as difficult, long, expensive, and frustrating because everyone comes at the issue from a different perspective or mandate, and if participants feel they are losing in the process, they put obstacles in place. However, a solution was eventually arrived at, but only after what Manley describes as much pain and sweat (Manley, 1995). While not having an alternative, Manley (1995) suggests the best approach is problem recognition and then try to get people to the table with the understanding that if they are at the table, they have to buy into the process.

Manley is also quick to criticize the current form of watershed studies. His main concern is that after a subwatershed study is complete and hundreds of thousands of dollars spent, only the acceptable portion of the study becomes implemented, when the premise of subwatershed planning is accepting the plan as a complete package (Manley, 1995). Unfortunately, this situation exists in the Draft Official Plan, as a subwatershed plan will only be incorporated into the Official Plan if supported by County Council.

Organizational Culture and Attitudes

There does not appear to be a sense of turf protection in the planning department As Manley (1995) indicates, part of the reason for this is the one-tier planning structure where the planning staff is involved in both local and County planning This results from a one-tier planning structure that does not involve a division of power between tiers

With a centralized planning office, communication on common issues of concern due to the close physical proximity of the planners is expected However, general discussions on issues like environmental concerns do not occur. With planners assigned to various area municipalities, the tendency is to consider the issues facing that particular municipality Manley (1995) notes that discussions on environmental planning issues rarely are raised, although the opportunity exists by all the planners being in the same office

In attempting to get interviews with the municipal planners for the townships located within the Grand River watershed, all three were reluctant to participate on the basis that they did not feel confident or competent to discuss the topic of buffers and environmental planning Instead, referral was made to the planner in charge of the environmental component of the new draft Official Plan. This new Official Plan contains significant environmental content that will have to be dealt with by these planners. Therefore, it is concluded that these planners will have to become more conversant with environmental planning and the new policies than was previously required.

Concerning buffer zones, Oxford has shown a positive response to the concept Within the draft Official Plan, buffers are specifically referred to for protecting water quality of streams and wetlands, although no specific distances are specified. This was done to consider the needs

of the individual situation (Manley, 1995). This would allow a highly sensitive area to have a wider buffer than would be established in a standard, and likewise for a reduced buffer width if the standard is wider than needed

The concept of watershed planning is supported by the municipality since planning should not stop at the political boundaries, and impacts upstream are going to affect downstream. The Conservation Authorities are also supported, although Manley suggests the public at large may not support more power being given to the Conservation Authorities if the results are further restrictions on land uses, especially in rural Ontario. Manley (1995) warns that while the Conservation Authorities are supported locally, Conservation Authorities are not universally loved by the public in other parts of the province.

Summary

The County of Oxford, like the Region of Waterloo, is influential in buffer promotion and creation Unlike the Region of Waterloo, Oxford specifically mentions buffers in its draft Official Plan for a wide range of applications, and in this respect is ahead of Waterloo in buffer recognition. Like Waterloo, Oxford supports the concept of watershed planning to deal with environmental planning. For planning, the planning structure of Oxford eliminates differences in planning ideologies that can exist between two-tier planning as the County both develops and implements policy. However, the centralized planning structure does not appear to facilitate increased discussion of environmental planning matters such as buffers, although the potential exists.

5.4 Conclusion

This chapter has identified many components of the current institutional arrangements for riparian buffers in Ontario, and this addressed the first study objective The analysis reveals governmental agencies and municipalities with a wide diversity of overlapping mandates and responsibilities regarding the management or creation of riparian buffers Despite the variety of agencies, no explicit buffer policy exists at the provincial level The OMMA has the Natural Heritage policy, with buffers defined within the context of corridors The OMNR is the agency closest to having a policy with its vegetative buffer guidelines Municipally, only the City of Waterloo through its Official Plan Amendment No. 16 and the County of Oxford in its Draft Official Plan have explicit buffer policies.

The research indicates that adequate structures exist within the various governmental agencies for planning and managing of buffers. However, these structures could integrate function and legitimation considerations into a more efficient framework, such as monitoring and enforcement functions. Like structures, many statutes are applicable to buffers and could be used to facilitate buffer creation and protection. However, some legislation, such as the Weed Control Act, can negatively influence naturalized buffers

One of the major problems of the current arrangements is a lack of official recognition of, and protection for buffers. Currently, the only legal mechanism to implement buffers is during development, or when a land use change occurs. In these circumstances, the buffer is generally limited to flood plain lands. Additionally, these lands are generally zoned "open space", the same as parkland. Although it is possible to zone general buffers along stream corridors in rural areas, there is no method to enforce these buffers as existing uses are legal

non-conforming. Only when a change in land use occurs, such as a zone change or severance, can a buffer be legally imposed, thereby offering long-term protection.

A major limitation to buffer creation is the lack of incentive programs. In rural areas, the only programs are the Environmental Farm Plan ($500 maximum), and the CURB program (although buffers are not directly eligible, it allows up to seventy-five percent of the cost of fencing watercourses). No programs for direct buffer creation, like Permanent Cover II, have been established. Urban areas are limited to special programs, such as Tree Plan Canada, to aid establishment. One tax break that could be used is the Conservation Land Act, but eligible programs under this Act are being eliminated. If rural land owners receive the Farm Tax Rebate, no tax is being paid on riparian lands, therefore an additional tax break is not an incentive to implement buffers. Given the spatial area of privately owned riparian land and the lack of government resources to purchase or manage potential riparian buffers, private stewardship incentives are necessary.

The second study objective was to examine the problems related to institutional arrangements conflicting with ecological units as they apply to buffers. The major problem is a lack of continuity across administrative or political boundaries for environmental issues. At the municipal level, where land use planning is undertaken, the problem is that a municipality only plans for what it has jurisdiction for, as it cannot plan beyond its borders. Thus, problems in environmental planning occur because planning stops at boundaries. For example, the City of Waterloo has implemented buffers for the Waterloo west side to improve water quality and deal with erosion concerns. However, erosion problems are also the result of activities in the headwater townships, which do not see any urgency to implement buffers, nor have the ability

to implement since development is not occurring in the area. However, in this example the upper tier municipality (Region of Waterloo) could intervene and coordinate the municipalities for buffer creation. Major problems also occur when upper tier municipalities disagree with each other. For example, a watershed study across upper tier municipal boundaries may recommend the creation of buffers, and one municipality may incorporate this recommendation into its Official Plan, but there is no requirement for the other municipality to follow with a similar adoption.

One method becoming popular to deal with cross-boundary issues is watershed planning that brings relevant stakeholders to the table to develop a common plan It is through this process that buffer strategies and recommended uses can be determined based upon site-specific information. This is becoming institutionalized in the land use planning process, as evident in the support for watershed/subwatershed planning in the Region of Waterloo's ROPP and the County of Oxford's Draft Official Plan. However, wildlife planning may require a different scale, such as the bioregion, as wildlife does not conform to hydrologic boundaries

A third study objective has been to determine the level of integration that exists between government agencies regarding buffers. At the provincial field office level, improvements are necessary to facilitate links. Despite the role of buffers as a measure to control non-point source pollution, the MOEE is absent in the promotion of buffers, as locally they have not requested a buffer. Even that ministry's CURB program does provide some funding, support for recognizing or promoting buffers is limited. However, the CURB program does reveal an integration link, as the program is locally administered by the GRCA However, there is no contact between the local MOEE field office and the GRCA The CURB

program is an example of a link that could be integrated to include OMAFRA. OMAFRA has links requiring improvement for buffer zone establishment, including current links to the GRCA through the Beaver Creek demonstration project. However, links need to be strengthened and to be regular, instead of occurring on an individual project basis. These links have not been strengthened in the past as OMAFRA has focused its attention on partnerships with NGO's, especially the Ontario Soil and Crop Improvement Association, rather than with other government agencies.

The most successful institutional integration is between the OMNR and the GRCA. This linkage is largely the result of the similarity in mandates regarding water management combined with the organizational and financial connections of the GRCA to the OMNR. It is usually either or both of these agencies that recommend buffer creation.

At the upper provincial level, one form of integration being established is through an Inter-ministerial Committee under the Environmental Bill of Rights Act. This committee brings together the ministries identified in the statute to foster continuous dialogue on the development and application of the Statement of Environmental Values for the ministries. This is one forum where an integrated buffer policy for the province could be created and channeled through the various applicable ministries for implementation.

At the municipal level, little interaction exists among lower tier municipalities, and among upper tier municipalities. Informal contact does exist, such as the Regional Planning Directors meetings, and through conversation when issues arise, but it is not regularized and formal interaction exists. Within Waterloo Region, the Area Planners is a group that could

potentially facilitate contact and communication on common environmental planning issues However, the research indicates this group is presently idle

For municipalities, close links exist with the OMMA through Official Plan approval, dispute resolution (OMB), and the Planning Act In this respect, the OMMA has power over buffers as land uses through the approval of Official Plans, the policy statements in the Planning Act, and OMB decisions. For buffers, the municipalities also work closely with the OMNR and the GRCA (Conservation Authorities in general), by consulting on appropriate buffers within the County of Oxford Draft Official Plan

Chapter Six

Discussion

6.1 Introduction

To continue the analysis of the institutional arrangements, this chapter discusses specific management and planning aspects for riparian buffer zones. This is designed to explore further objective one, the identification of current institutional arrangements for buffer zones in Ontario. Furthermore, several options for each institutional aspect are presented, fulfilling objective four, the identification of opportunities and constraints for establishing an integrated approach for riparian buffers.

This chapter is structured around three key aspects that must be addressed in integrating institutional arrangements for riparian buffer zones: management, legal, and policy. The first section discusses management issues maintenance, stewardship, public participation, monitoring, a lead agency, and boundary issues. The second section considers legal issues involving buffers. Thus, this section discusses the recognition of buffers, enforcement issues, and financial considerations. The third section considers policy issues.

6.2 Management Issues

6.2.1 Watershed Planning

Watershed planning is one method of undertaking integrated environmental planning while dealing with boundary issues. Buffers are ecological features that must be implemented on an ecological basis, with the watershed being one option. Watershed planning has been increasingly advocated in the Province of Ontario, as evident in the final report of the Royal

Commission on the Future of the Toronto Waterfront (1992), and the final report of the Commission on Planning and Development Reform in Ontario (1993). While the new provincial policy statements do not explicitly mention the use of watershed planning, it must occur to achieve the Natural Heritage Policy goal "to protect the quality and integrity of ecosystems, including air, water, land, and biota, and where quality and integrity have been diminished, to encourage restoration or remediation to healthy conditions" (OMMA, 1994a) Specifically, watershed planning has been advocated for the Grand River watershed to deal with cross-boundary issues (OMMA, n.d.) This report concluded that to balance economic and environmental priorities in the watershed, the long-term settlement, servicing and infrastructure planning must be coordinated through watershed planning (OMMA, n.d . 5)

Environmental planning is a major concern when coupled with social and economic planning considerations, as these latter two issues are handled within an administrative boundary structure The problem, as Trushinski (1995) views it, is that humans have created boundaries to manage the environment within our limits when it should be the other way around. Therefore, it is important to consider economic, social and environmental issues equally in the planning process instead of environmental issues being an afterthought To do this, Gosnay (1994) sees a need to blend the values of watershed-based planning with community planning. Buffers are an example where these values can become blended.

Watershed planning is a departure from traditional land use planning While the watershed complicates the traditional planning process, it is appropriate for land use planning to achieve a sustainable and healthy society. Land use decisions are critical according to Duke (1994), as decisions are almost always permanent and irreversible, and thus, must be based

upon criteria that will not impair future generations. The problems of retrofitting buffers reflect the difficulty of reversing land use decisions.

Watersheds and subwatersheds are logical units on which to plan sustainable communities, as much of the past environmental damage has been caused by hydrologic cycle disruptions. Environmental planners, such as Ionson (1994), state that subwatershed studies allow environmental planners and managers to become aware of the ecological processes occurring at this scale and the best methods of preserving them. From a hydrologic viewpoint, Minshall (1995) says we must consider that the alternative to watershed planning in urban areas is concrete drainage channels which municipalities can no longer afford to maintain. Natural stream corridors with buffers are seen as an alternative. Watershed planning resulted from a recognition that master drainage plans could not occur without planning other ecosystem components, since ecosystems are dependent upon particular hydrologic regimes (Minshall, 1995). With a watershed focus, issues are considered with a broader perspective than is possible by individual municipalities. This is one of the reasons Conservation Authorities were initially developed. Currently, the Conservation Authorities are the only government agency explicitly structured to manage on natural ecological boundaries.

There is some question if the watershed is always the appropriate basis for ecosystem planning. However, Minshall (1995) notes that most remaining natural areas are not located in urban areas or under intensive agriculture, but are the riparian corridors and wetlands that were not economically feasible to convert to other uses. It is within these riparian areas that buffers are advocated. Essentially, two ecosystem planning options exist: a watershed basis or an individual site basis. A watershed perspective allows a broader perspective to be considered than individual sites, since a specific site is not a closed system, but linked to a broader

ecosystem. Only by considering a broader context can macro-level issues, such as cumulative effects, be adequately mitigated.

While the watershed is considered an ecosystem for land use planning and management (especially for hydrologic purposes), it is not necessarily appropriate for all circumstances For example, Cooper (1994) comments that some wildlife (i.e deer) does not conform to watershed boundaries, and as such, cannot be managed on a watershed basis In this context, a larger focus, such as the bioregion, may be an appropriate management unit The watershed is also not always appropriate for natural heritage systems. One example Minshall (1995) notes was discovered during the Blair watershed. For the study, terrestrial experts placed the core areas of the Blair watershed within the larger context of the Grand River natural heritage system. It was discovered that the natural heritage system that the Blair watershed is part of runs from the west end of Laurel Creek through Strasburg Creek, through the Roseville Swamp and Cedar Creek, to the Grand River in the Pinehurst Conservation Area north of Paris. The Blair watershed is actually a secondary level natural corridor system that crosses the Roseville Swamp to the Grand River, and while not a major artery, is nevertheless important. Therefore, it is important to look beyond the relatively small context of a twenty square kilometre watershed and consider a larger picture if buffers are combining water quality objectives with wildlife corridors.

One of the major limitations of watershed planning, according to Manley (1995), is the benefit of the process. A watershed study can bring together all relevant individuals, groups, agencies and municipalities within a watershed to the discussion table. The aim is to arrive at a mutually acceptable watershed plan to meet desired goals and objectives. This plan is an integrated and comprehensive package, and to be effective, it must be accepted and

implemented as a whole. However, this is rarely the case. Commonly, only the politically and financially acceptable components are implemented. The view of Manley (1995) is that unless a watershed plan is adopted as presented, environmentally there is little reason to devote finances and personnel to the study since the plan must be accepted completely to be successful.

6.2.2 Maintenance

A major management concern for buffers is maintenance Maintenance can range from a low level for a naturalized buffer, to a high level for a manicured buffer. A low maintenance buffer has a long-term cost advantage in terms of time and financial commitment. The maintenance level is also subject to adjacent land uses. In urban areas, a buffer may require a certain level of maintenance such as shrub and branch trimming, to ensure public safety. In urban areas, the tendency is towards a managed buffer to increase public acceptability based on aesthetic considerations. In rural areas, safety and aesthetics are of less concern, and a minimal maintenance, naturalized buffer is desirable.

6.2.3 Stewardship

Stewardship is the traditional management approach for environmental planning and management on private land in southern Ontario, including the creation and maintenance of buffers. As government cuts continue and fewer public resources are available for environmental management, there will need to be an even greater reliance upon private stewardship. However, this reliance raises a serious concern: if stewardship is a current

approach, and this situation needs improvement, can improvement be achieved with greater emphasis on one of the problems? The answer is mixed

Governments do not have resources, staff or financial, to directly acquire and manage additional conservation lands. With large amounts of land in private ownership, private stewardship is the only effective method to manage a large geographic area that an initiative like riparian buffers require. However, the current form of stewardship must change to correct inadequacies (i.e. slow adoption, sporadic implementation) As creatures of habit, people are slow to adopt new methods. In some cases, farms are family institutions, leading in some cases to the philosophy that 'if it was good enough for my parents, it's good enough for me' (Duke, 1995). The attitude also exists that as conscientious land owners, farmers are already good stewards of the land, and therefore, there is no need to alter the situation

Stewardship includes education that allows the landowners to consider their property within a broader regional context. The consideration of boundaries has until now concentrated upon institutional aspects. However, this is only part of the management context At the individual property owner level, boundaries are just as important, if not greater, than those existing at the institutional level. Property owners exercise ultimate power over their property within the established laws and property rights These individuals will ultimately decide the best approaches to managing their property. Like municipalities, individual property owners make decisions only over that which they have jurisdiction. This creates a problem when developing a conservation strategy, such as buffers, for an agricultural watershed community Those that buy into a stewardship ethic will participate, but those that do not affect the effectiveness of those who do participate. Currently, property owners are not required to utilize

stewardship efforts in managing their property. Stewardship is still a voluntary approach to land management

Although stewardship is generally considered as a private land owner initiative, a continuum exists from private to public stewardship An integration of these two resides between the extremes, as summarized in Table 6 1

Table 6.1 Stewardship Options

Option	Positive	Negative
Private	* inexpensive to the public * reflects the current situation * public plays a role in management	* difficult to achieve larger strategy * protection for the long term not ensured
Integrated	* combination of public and private * benefits of combining both	* considers both, but can do both poorly
Public	* ensures protection * professionally planned and managed * usually public access * ensures a common strategy	* cost to taxpayer * lack of public role in management

Source: Author

If stewardship is adopted, the private approach is often advocated as it is inexpensive to the public through avoiding tax dollars spent on planning and management. In many circumstances, it is the current practice, especially in rural areas. Private stewardship also represents public responsibility in natural resource management, a role that the Ministry of Natural Resources stresses in the Direction 90's document (OMNR, 1992a).

While the private role has advantages, public stewardship also has advantages. Public stewardship ensures the long-term protection of the buffer, whereas the private approach does not have such definite protection. The land owner may remove the buffer at will unless

officially recognized. The public role also means that buffers are professionally planned and managed so that the buffer should be effective for its various purposes. With a private approach, it is difficult to achieve broader strategies, such as multiple use buffer zones If publicly owned, the buffers also have the potential for public access and use This can be desirable if public access, such as a trail system is desired. However, public stewardship in its purest form has two major disadvantages, namely the financial cost to the taxpayer, and the lack of public involvement and responsibility in resource management

The integrated approach strives to combine private and public stewardship A variety of combinations can emerge, with the ideal form combining the positive aspects of both The integrated approach is desirable for several reasons. First, land ownership is divided between private and public ownership, and public purchase and associated maintenance of buffer zones are financially infeasible Second, the large spatial extent of buffer zones makes sole public management an impossibility and private assistance essential. Third, integrated management allows for the creation of a common strategy (public stewardship) with professional advice and assistance, while being delivered by individual land owners (private stewardship)

6.2.4 Public Participation

Public participation in buffer zone planning and management processes is desirable At the provincial level, participation is an aim of all the ministries, identified in this study through the EBR SEV's. The public must be involved in the process, otherwise opposition tends to emerge, and the initiative may fail.

Public participation is central to most environmental initiatives, and buffer zones are no different. If stewardship is a key initiative, then the public should be actively involved in buffer

management, especially in rural areas. In an urban context, environmental groups may also be active in buffer establishment, maintenance and monitoring on municipal property in cooperation with the municipality. This can transfer part of the burden from the municipality while citizens acquire a clean environment. Through involvement, Ionson (1994) explains that these lands are no longer considered just city land, but the community takes a sense of ownership and pride in the environment, and works to protect it.

According to Trushinski (1995), to make the planning and management process work well, the public must be brought into the process at an early stage. Attempting to impose a plan upon the citizens is undesirable, since resentment and resistance usually occur based on non-involvement in the process. Since the community must live with the plan, they should be involved in the process. It is wrong to impose a standardized planning, as plans should reflect the needs of an individual community.

The public should also have a major role in policy direction. Trushinski (1995) states it is often said politicians are the decision makers, but the truth is the public can have the ultimate say through active public participation. A special interest group that becomes highly visible through writing letters to newspapers, telephoning politicians, and visiting council meetings will facilitate action. A community-driven initiative will receive less resistance because any opposition must confront the community proposing the initiative rather than just municipal council. Council can use the public support as a shield in the decision, as the community advocated the initiative.

Public participation is also essential for buffer management. Table 6.2 outlines several options for public participation in the planning and management processes.

Table 6.2 Public Participation Options

Option	Positive	Negative
None	* shorter process	* draconian * imposing planning and management leads to resistance of acceptance
Some	* public plays a role in management	* the public could be playing a role * does not take burden off public management
High	* community involved in planning and management * leads to better acceptance	* time results in increased costs * time consuming

Source: Author

Besides the public role in stewardship, the public should be involved in the buffer zone planning process. This will help to ensure public acceptance, as imposed plans have a greater chance of failing due to a lack of public participation in the process, and a view that a policy or plan is being imposed. The advantage of no public participation is a shorter process, as public participation can last several years. However, this must be weighed against the cost if the public challenges a proposal resulting in court or OMB costs, or the plan is shelved, and therefore, become a complete waste of resources.

A high level of public participation is desirable, as the public can be actively involved in resource management. For buffers, it is the public that will eventually have to live with them, and in many circumstances manage and maintain the buffers Consequently, the public should be involved in determining composition and multiple use strategies. This can generally be accomplished through watershed and subwatershed planning. With public input from the initial stages, the likelihood of public acceptance is improved. Although public participation can

increase the resources required in the short term, overall, the improved chance of public acceptance may offset these costs.

6.2.5 Monitoring

Monitoring is critical to any effective management plan for riparian buffer zones. While an important function, the common concern for both municipal and provincial agency people is the lack of staff and resources to undertake this function. While this may be true from an individual agency perspective, from an integrated management viewpoint the statement may be somewhat inaccurate.

For buffers, a significant problem has been a lack of monitoring. Although many buffer demonstration projects have been undertaken, Graham (1994) notes these are not being monitored. These sites would provide excellent opportunities to evaluate the long-term impact and effectiveness of buffers. Cooper (1994) comments that monitoring has been neglected by all agencies and blames this on a lack of time and money available, and a lack of clarification of which agency has the mandate for monitoring. Cooper (1994) also suggests uncertainty exists on what to monitor, a problem exacerbated by the lack of science concerning buffers.

The monitoring of buffers should not be undertaken exclusively by agency staff. Monitoring is an excellent opportunity to involve the public, and is advocated by many of the planners contacted (MacMillan, 1994; Ionson, 1994; Trushinski, 1995; Manley, 1995). According to Trushinski (1995), community-based monitoring programs can be an effective way of working towards a healthy watershed (and buffer) by having the public involved in technical and non-technical aspects of monitoring. The non-technical aspects of monitoring involve basic activities, such as walking along the stream corridor, and if they discover slicks,

erosion sites, beaver dams, non-native species invasion, buffer encroachment, and citizens doing things out of the ordinary (i.e. wood storage, garden shed placement within the buffer), and reporting these activities to the proper authorities. For technical monitoring, Trushinski believes that community citizens can be trained to collect technical information, including temperature and water quality data. However, for effective monitoring, there must be a strong commitment on the part of community participants to collect the data consistently This includes after storm events, on weekends, and in winter - times that may be inconvenient for many community participants (Trushinski, 1995).

Assets often overlooked for monitoring the conditions in the Grand River watershed are educational institutions, including elementary and secondary schools, universities, and community colleges. Schools can only play a limited role, as the maximum buffering function occurs during the summer months when schools are not in session. The Grand River is fortunate that all three universities within the watershed are capable of undertaking monitoring through professors or senior undergraduate courses. Such monitoring would provide valuable practical experience for students in environmental monitoring, while providing the agencies with a much needed and professional style of monitoring. Spagnuolo (1994) believes that this would be key to providing the much needed academic experience on buffers and monitoring Trushinski (1995) agrees with this, and suggests that the universities also undertake a greater role for buffers in design and monitoring by working through example, noting excellent potential exists on the North Campus of the University of Waterloo. Gosnay (1994) suggests this monitoring may not involve actual field evaluation, but may involve basic evaluation of air photographs on the five-year provincial airphoto recording cycle to analyze general trends in buffer loss, creation, or maintenance.

There still remains uncertainty about the role that provincial agencies will play in monitoring with the recent changes to the Planning Act. As the provincial agencies have been removed (at least in theory) from plan review as long as municipalities are consistent with the provincial policy statements, the potential exists for these ministries to assume a greater role in monitoring, as plan review staff becomes available. However, Duke (1994) expressed concern that the larger the area that the monitoring agency must cover, the less effective the monitoring becomes. Despite this concern, as monitoring must occur to determine if the municipalities are being consistent with the policy statements. Unless monitoring occurs, there is no mechanism except to trust that municipalities will be consistent with the policy statements. Even in a two-tier political system, the lower tier Official Plan must conform to the upper tier Official Plan. This requires the upper tier municipality to monitor the activity of the lower tier.

Within a development situation, monitoring is beginning. Trushinski (1995) states that the developer or land owner in the Region of Waterloo must undertake pre-development monitoring as part of the subwatershed study, maintain monitoring during development, and based upon an OMB precedent, once seventy-five percent of the development is complete (houses built and sod laid), the developer is responsible for monitoring the developed lands for three years. At this point, Trushinski believes the developer should be released from responsibility, and the beneficiaries (the province and citizens) should be responsible through agency partnerships, as the City of Waterloo is developing the first monitoring strategy in Ontario for subwatersheds.

Monitoring is one of the most crucial management functions for buffer zones. Often associated with enforcement, monitoring is necessary to determine effectiveness, possible

degradation requiring maintenance, encroachment, and compliance if financial incentives are provided, or if officially protected.

Table 6.3 Monitoring Options

Option	Positive	Negative
Institutional	* professional * accurate * committed	* cost
Public	* community involved * take part of burden * volunteer * cost effective	* level of knowledge * experience * time commitment * accuracy
Integrated	* best of all aspects of participation * burden is divided	* strong communication links necessary
Educational	* practical experience * qualified * reliable * cost advantageous	* burden on institution * quality of data
Landowner	* will already be undertaking maintenance	* unlikely to report personal violations to authorities
None	* easiest	* uncertainty * enforcement

Source: Author

Monitoring can range from none at all, to publicly involve monitoring, to educational institution involvement (schools, colleges and universities), to governmental institutions, or an integration of these various elements As Table 6 3 denotes, each monitoring option has several associated positive and negative aspects No monitoring creates uncertainty as there is no way of knowing if goals are being met, and for enforcement, there is no mechanism to determine if land owners are complying. Agency monitoring, while providing the best monitoring through well-trained professional staff, has financial costs attached that are a burden

to taxpayers, and the large spatial extent of riparian buffers makes full governmental monitoring unlikely because of budgetary restraints. Public involvement is an excellent mechanism to share the burden and is cost effective through the voluntary nature of the program. Basic monitoring can involve just walking along the buffer However, monitoring can have a time commitment that can become a problem, especially in determining water quality improvement. This may require monitoring after every storm event, and as such can become a burden upon the person monitoring

One aspect that is beginning to be explored is the use of the educational system to provide monitoring. This can provide students with basic monitoring skills in a practical situation while collecting data. If undertaken by upper year university or college students, then the quality of the data will be of a higher caliber since they will have more training. However, the cost of financing the monitoring is passed from the government to the educational system, and potentially to students in the university and college systems.

One option that must also be considered is that land owners can undertake basic monitoring since in many circumstances they are undertaking management and maintenance functions through stewardship. However, the weakness for landowner monitoring is the low likelihood of reporting enforceable violations to the proper authorities.

Another option is to integrate the monitoring among the various potential key actors. This allows for the best of all aspects of participation, while dividing the burden among the multiple participants. However, in the integrated system, there is a strong dependence upon communication, especially if monitoring is undertaken by a non-enforcement group. Strong lines of communication must exist

6.2.6 Lead Agency

The support for the concept of a lead agency for buffer zones is mixed While many participants agreed that there should be a lead agency to coordinate buffers, there were varied responses about who this agency should be The reason a lead agency is needed for buffers is that buffers involve many age ıcies, and therefore, these agencies must be involved through partnerships. As Dave Gosnay (1994) comments, if buffers are deemed desirable, one agency must take charge and actively promote buffer programs Spagnuolo (1994) suggests a lead is necessary to define the roles and responsibilities of the various ministries, as many ministries now avoid issues with the argument that they are not responsible

The GRCA is a popular lead agency candidate for buffer zones among those contacted The reasons for this vary. Gosnay (1994) argues that the GRCA has worked with buffers through test cases, and therefore has experience with implementing them Minshall (1995), while reluctant to suggest a single agency, recommends the GRCA for the promotion of cross-boundary issues, and that the GRCA will play a major role in buffers. However, Ted Taylor (1994) (OMAFRA, Resources and Regulation Branch) is against such a move, with the view that the Conservation Authorities already have too much control. Manley (1995) supports this view, stating that some agencies and individuals consider the Conservation Authorities having too much power over land use control.

On the other hand, Trushinski (1995) believes a municipality should take the lead in full partnership with the other applicable agencies. The reason for this is that some issues are localized to the municipality and do not directly involve the GRCA Thus, the GRCA may be involved on the team, but not in the lead role Trushinski cites a city lead project team comprising OMNR, GRCA, and city representatives that has worked together for one and one-

half years, and as this group meets two days a week, it as almost as if they work in the same office By working together, Trushinski sees this type of cooperation breaking down the old mindsets and mandates between the agencies, such as city versus OMNR (Trushinski, 1995). Trushinski also notes a need exists for a provincial agency to undertake policy research and development, and assist local municipalities in understanding the policy.

Partnerships are crucial to the process, as no single agency is capable of dealing with all buffer aspects. MacMillan (1994) believes municipalities do not have the staff to review all of these aspects, and usually depend upon the assistance of the OMNR to review plans. Additionally, for different aspects there may be a different coordinator, such as the OMNR for wildlife, physical factors like soil and water by the MOEE, and greater involvement of the OMAFRA MacMillan also sees this networking and partnerships occurring more often now than in the past.

Given the many government agencies and institutions noted in this research, many options for the role of lead agency exist. These are summarized in Table 6.4. Despite the arguments presented by Trushinski, municipalities are discounted based upon the limited perspective of the municipality for planning and management purposes. Similarly, the OMMA is dismissed, since land use planning is only one aspect of buffer zones, and the ministry as a whole is not directly involved in many buffer issues.

The OMAFRA is a likely candidate based on the large portion of the watershed in agricultural land use, the promotion by the ministry of BMP's (including buffers), and many of the past stewardship programs have occurred in conjunction with OMAFRA However, the OMAFRA is discounted as a lead based upon its singular agricultural and rural focus, and the limited focus of the environment within the ministry.

Table 6.4 Lead Agency Options

Option	Positive	Negative
None	* requires no alteration of the current situation	* problems of no coordination, * duplication of services * inefficient
GRCA	* currently only agency based upon natural ecological boundaries * involved in land use decisions through review and fill lines; flood plain	* view by some agencies that CA's have too much power * scale of GRCA may not be appropriate for localized situations
Municipality	* local level for public participation * level of land use planning	* limited to their own jurisdiction * no large picture view
OMAFRA	* much of land in agriculture	* agriculture area for buffers * limited environmental role in ministry * program delivery contracted out
MOEE	* primary concern environmental protection * water quality a major concern	* low profile of district office * low current involvement
OMNR	* address wildlife concerns * responsible for C.A.'s	* fragmentation caused by districts * Crown Land focus
OMMA	* currently is lead agency in terms of policy	* land use planning is only one component of buffers

Source: Author

The MOEE is also a potential lead agency based upon environmental protection and the importance of water quality to the ministry However, because of the low profile of the local district office and the fact MOEE has not requested buffers in the past, the MOEE is eliminated as a lead agency for buffer zone establishment.

The elimination of these other actors leaves the OMNR and GRCA as potential lead agencies, both of which possess great promise. However, the ultimate lead agency should be the GRCA, based on the following reasoning. The OMNR is responsible for the Conservation Authorities, addressing wildlife concerns, and has given considerable attention to buffer zones,

streams and natural heritage systems. Despite this, the OMNR maintains a large focus on Crown Lands While appropriate for northern Ontario, many of the buffers for southern Ontario are on private lands over which the Ministry does not have direct jurisdiction. Combined with this is the move towards watershed planning. The OMNR districts still fragment watersheds, such as the Grand River, and the GRCA is the only agency in the watershed structured upon ecological boundaries. The GRCA also has close contacts with the local municipalities through land use decisions for flood plains and wetlands, and local representation on Authority membership. The GRCA also has links with the OMAFRA for buffer demonstration sites, and with the OMNR through the administrative structure. The existence of the Grand Valley Conservation Foundation and its potential to act as a land trust also enhances the desirability of the GRCA as a lead agency. For municipalities, such as Oxford County, that are divided by several Conservation Authorities, these Authorities would also take the lead because as Manley (1995) notes, it is better to have several approaches within one municipality than several approaches within one watershed/subwatershed

The role of the lead agency would be to coordinate the activities of the other agencies and ensure consistency in implementation, and act to coordinate the monitoring and enforcement aspects of management. This agency would also disseminate information regarding buffers to the various agencies and the public and help to facilitate public participation through such planning mechanisms as watershed planning.

6.2.7 Boundary Issues

For environmental management, political and administrative boundaries will always be a major concern. Fragmentation of the resource management sector and the resulting

administrative boundaries are a reality, and thus it is important that institutional barriers are reduced. The use of an integrated management approach is one method to reduce this friction Many of the current political and administrative boundaries have evolved over the past one hundred years and are unlikely to alter significantly in the next one hundred years Politically, the upper tier municipal boundaries have remained relatively constant over this period, despite several internal municipal restructurings. Only the Region of Waterloo has been physically altered at the expense of the Region of Hamilton-Wentworth. Internally, restructuring has reduced boundary problems through lower tier municipal amalgamation However, many municipalities still require restructuring. Municipal boundaries also influence provincial agency field service delivery The OMNR and MOEE are in many cases based on township boundaries, and OMAFRA is based on county offices as it was a century ago, although amalgamation is beginning.

Boundary problems are difficult to overcome at the municipal level, resulting from long established political boundaries, and the introverted view of municipal politics. Municipalities maintain an inward view as they do not have jurisdiction or control of circumstances outside their own political boundaries. Hence, ecological features, like buffers, tend to stop at municipal boundaries. This is not to say that a solution to the problem is impossible According to Gosnay (1994), the current system has mechanisms that are probably fairly effective for overcoming boundary problems within the current legislation. However, the use of these mechanisms has been lacking It is a question of political will at the municipal and provincial levels to utilize these mechanisms that have proven difficult. This lack of political will Manley (1995) believes is the result of different municipalities having different objectives

and levels of buy-in to environmental issues and varying disposable resources to deal with these issues

The question of available resources is crucial to countering boundary issues Integration and coordination require two critical municipal resources· time and staff (Spagnuolo, 1994). The rural case municipalities each have a single planner responsible for all municipal planning functions. The move towards considering cross-municipal issues requires meetings and responsibilities beyond the current capability of many rural planning staff(s), and with limited financial resources, increased staff, although desirable, is unlikely to happen.

One mechanism gaining popularity for combating boundary problems is watershed planning This allows municipalities to undertake environmental planning on a basis beyond their own limited political jurisdictions, as well as bringing provincial agencies to the table. The City of Waterloo encourages the use of watershed planning and the use of inter-jurisdictional teams that the private sector has used for years (Trushinski, 1995). One example is the Laurel Creek Watershed Implementation Advisory Committee, comprising watershed municipalities, provincial agencies, developers, and local citizens with the aim of facilitating discussion of implementing the watershed study. This group is advisory only, with no power to enforce implementation recommendations. The current situation reflects the need for integration to counter the barriers, and this is one reason watershed planning is undertaken. Minshall (1995) believes that without the watershed planning process it is very difficult to overcome boundary problems, but if the process is used, then boundary problems are not an issue.

The experiences of the City of Waterloo are unique in that watershed studies involve the city and other municipalities within the Region of Waterloo, thus allowing the upper tier municipality to coordinate if conflicts arise. However, the City of Cambridge has shown that

cross-boundary planning between upper tier municipalities can occur in such studies as Mill Creek involving the Region of Waterloo and Wellington County (Ionson, 1994) As buffers are usually a recommendation of watershed studies, the opportunity exists for consistent buffer implementation across municipal boundaries Another example is Fairchild Creek involving two Regional Municipalities and two Counties, and according to MacMillan (1994), cooperation is essential to undertake the work that the GRCA wishes to do Thus, watershed planning may be the most effective means of dealing with boundary concerns if limited municipal resources are adequately addressed. With the provincial government down-sizing, the trend is to download program delivery to the local level For water management, the Conservation Authorities may be responsible for coordination across municipal boundaries, while land use issues are handled by the municipalities These groups will have to define their respective roles.

The boundary issue has been aided in recent years with the restructuring of the OMNR Before restructuring, the Grand River was divided not only by districts, but regional offices as well. While Waterloo Region was in the Central Region, Oxford County was part of South-West Region. The common location in the Southern Region provides a certain degree of consistency in policy and practice that can vary from region to region This variation in planning and policy can also occur in municipalities divided among watersheds

For environmental planning, three main options exist conventional, integrated, and comprehensive (Table 6.5). Conventional planning is the traditional planning approach and is based upon artificial units fragmenting the environment into manageable units based upon administrative boundaries. In this circumstance, planning stops at the administrative boundary

with little or no continuity across the boundary, which ecologically is improper. Therefore, conventional planning should be dismissed as a future practice for planning buffers.

Table 6.5 Planning Options

Option	Positive	Negative
Conventional	* no alteration of perspective * familiar	* planning stops at boundaries * no continuity * improper ecological considerations
Integrated	* look at a broader picture * ecological planning * watershed planning * efficient * multiple perspective * consensus building	* unfamiliar * lack of local control * compromise and satisficing * time consuming * broader strategy
Comprehensive	* most desirable * considers everything and interactions	* beyond current abilities to undertake

Source: Author

A second option is an integrated planning approach This considers a larger environmental perspective by planning and managing on environmental terms, not human terms (artificial boundaries). This allows for multiple perspectives and multiple uses through a process of consensus building. The integrated approach considers selected key elements and their interactions, which for riparian buffers include physical conditions for width, and the composition for multiple objectives. However, integration is unfamiliar to municipalities, and to a degree removes local control for land use planning. Based on compromise, integrated management can achieve multiple objectives, but potentially at the expense of full achievement of a singular objective. Integrated management and planning are also more time consuming in

the consensus-building process than is the conventional process Nevertheless, an integrated approach is an excellent method to use in managing and planning buffers

A third option, comprehensive planning, is completely beyond current abilities as Mitchell (1989: 305) notes, and therefore is unfeasible for current situations Thus, it is eliminated from consideration.

6.3 Legal Issues

6.3.1 Recognition

Despite the recent interest in buffer zone creation, no clear official recognition of these zones for planning purposes has emerged. In an urban context, much of the land capable of buffer establishment is considered flood plain and is taken by the municipality as undevelopable In this situation, these lands are generally zoned 'Open Space' and utilized as parkland Thus, the problem is that the buffer is indistinguishable from the feature it is protecting as this designation is no different from an active park setting. Ionson (1994) comments that a form of buffer recognition has been the City of Cambridge's parkland fencing policy that definitively establishes the limit of adjacent lots. While personally against fencing measures, she suggests markers located at property corners are an alternative and would permit an enforcement official to determine encroachment.

Trushinski (1995) supports the notion that buffers are generally grouped within an open space definition. He suggests the reason for this is that most Ontario municipalities are struggling to set aside woodlots let alone buffers, and that many municipal staffs are not informed of what a buffer means, while other municipalities still balk at the concepts of corridors, linkages or islands of green. From a City of Waterloo perspective, the city uses

constraint level mapping for recognition, with Constraint Level One as highly sensitive and protected, Constraint Level Two as not as ecologically sensitive, but the functions are important and must be protected at all costs, and Constraint Level Three with a low ecological value and development allowed using BMP's. However, when the buffer is determined around Constraint Level One and Two areas, they are shown as 'Open Space' on the official plan, and are protected through that designation. Future development in those areas would require a zone change, so Trushinski says there is accountability in the designation.

From a rural perspective, official buffers do not exist and will not exist unless development or a change in land use occurs. In many cases, buffers may exist, but are not officially recognized in municipal planning documents as a separate designation, but instead are included within agricultural zoning. Although it is possible to impose a buffer designation through zoning by-laws, this method has serious limitations. First, all prior uses to the bylaw are considered legal non-conforming, thus it is not possible to legally enforce a buffer. Second is the issue of buffer width determination. Duke (1994) states that buffers can be created by zoning bylaws, but to do so the buffer must be identified, and as zoning is a refined level of land use control, the buffer limits must be known, requiring costly surveys. As neither land owners or municipalities benefit, they are unlikely to bear the cost. The other alternative is to set a fixed distance buffer along the stream, which does not represent good ecological planning practices.

The only way a buffer can be legally created in rural areas is if there is a change in the legal land use designation, such as a development or a severance. Dembek (1994) notes that the Township of Wilmot has not had requests to set up buffers, but raises another issue. Recognition, such as zoning to protect an area as environmentally protected, indicates a land

use, and as such, what is permitted upon it? If left to naturalize, Dembek states that there will be complaints over weeds, and for maintenance, complaints of spraying, but cutting solves nothing if the roots remain. Therefore, the actual uses permitted in recognized buffers need to be thought out before implementation

Given these situations, several options are available for recognizing buffers, some of which are presented in Table 6.6.

Table 6.6 Buffer Recognition Options

Option	Positive	Negative
None	* no change in legislation * no policy change	* no separate recognition means treated like park land (urban) * no legal protection * not recognized at all in rural areas
Stewardship Agreements	* limited protection * cooperative partnership * current practice * voluntary	* limited protection * slow implementation * sporadic implementation
Conservation Easements	* long-term protection * can be held by a land trust	* can be impacted by adjacent activities * uses restricted to those defined
Legal Status (municipal ownership)	* legal protection * easements one aspect * protected in perpetuity * multiple uses * can be held by a land trust	* defining incurs costs * ownership incurs costs * cost of acquisition

Source: Author

Non-recognition represents the current situation, and as such would require no alteration in legislation or policy. However, this has serious implications No recognition results in buffers being classified in most urban situations as open space - the same as park land. Despite the

ecological function of buffers, it is not given specific recognition and long-term protection. In rural areas, buffers may or may not exist, but are not officially recognized and protected.

Stewardship agreements are a second option. These provide limited buffer protection through the terms of the agreement, represent the current practice of cooperative partnerships between land owners, NGO's and government, and are voluntary. However, for wide-scale implementation, stewardship agreements have negative aspects The protection is limited to the terms or length of the agreement. Since the program is voluntary, implementation, as evident in past programs, is slow and sporadic. Nevertheless, stewardship agreements are a feasible implementation measure for buffer protection and recognition.

A third option is the creation of conservation easements. These offer long-term protection for the buffer and can be used for other purposes if identified in the easement The easement also allows for official recognition, and can be held by a land trust to manage. Despite these aspects, the buffer can still be affected by adjacent land use activities, and buffer uses are restricted to those defined in the easement. This is because despite the registering of the easement, the land is still privately owned.

A final option is to bestow legal status on the buffer, usually through municipal ownership In this situation the buffer is legally defined and protected in perpetuity. Easements are also one aspect of legal status, and multiple uses are possible as a result of buffer ownership These lands can also be held by a land trust. While legal status through ownership is the best option, the financial costs make the situation extremely unattractive. To legally define, surveying must occur, resulting in costs. Ownership in itself carries costs, including acquisition and maintenance costs.

6.3.2 Enforcement

Many avenues exist for improving enforcement - if the ministries cooperate and integrate operations (Table 6 7).

Table 6.7 Enforcement Options

Option	Positive	Negative
Individual	* control of mandates	* inefficient
Integrated	* efficient * could centralize in one ministry * increase links between ministries	issue of reporting * problem of cross training * limitations of some legislation and municipalities confined to their mandates

Source: Author

Within the current legislation, there are many enforcement mechanisms through inspection officers. At the provincial level, the OMNR has Conservation Officers for monitoring and enforcing such statutes as the Endangered Species Act, and the Fish and Game Act, OMAFRA (through municipalities) has Weed Inspectors enforcing the Weed Control Act, and the MOEE has inspectors for such statutes as the Environmental Protection Act, and Ontario Water Resources Act. In theory, all of these various inspection officers undertake separate enforcement roles. Thus, individual agencies may be accurate in claiming that they lack the staff to undertake broader monitoring and enforcement roles However, combining these various inspection officers could accomplish the task, either through an inspection officer with broader powers, or by monitoring and reporting situations to the correct inspection officer In some cases, the broadening of inspection powers could be accomplished without changes in legislation. For example, the Environmental Protection Act indicates provincial officers as persons designated by the Minister of Environment and Energy as a provincial officer for the

purposes of the Act and regulations. In this circumstance, it is possible that a Weed Inspector could also be empowered to enforce the Environmental Protection Act, although the question of jurisdiction, authority and employment of the officer for a ministry could be contentious It may ultimately be desirable to have the responsibility for all enforcement consolidated under the Ministry of the Attorney General to eliminate potential conflict

Within this framework exists local enforcement mechanisms, which are largely the responsibility of the by-law enforcement officer(s) The role of this officer is limited to the enforcement of the local municipal by-laws However, cooperation with provincial officers could aid both parties in their enforcement and monitoring duties

Within an urban context, encroachment is the major issue The traditional subdivision design backs lots onto natural features, requiring a protective buffer. However, the land owner slowly takes possession of the land behind the property line, using it for such things as garden sheds, kennels, yard waste disposal, and general storage. The primary reason for the use of the buffer is to degrade the buffer rather than the core feature, but the buffer requires protection as well.

Trushinski (1995) attributes the encroachment problem to poor development design that could be addressed by basic considerations in the initial development design The most basic design feature that helps to limit encroachment is the establishment of a community trail immediately to the rear lot line. If public access is maintained at the rear of the lot, a property owner is less liable to extend the property. With public accessibility at the rear of the lot, the property owner loses some privacy, and is apt to install a fence that serves as a physical barrier for encroachment. The fundamental flaw with current trail design is that trails are often installed after development, and hence, there is objection to trails immediately near the property

line Thus, the trail tends to be pushed farther into the buffer for privacy screening, and encroachment continues up to the trail Municipalities are beginning to require trail installation with the development to deal with this problem (Trushinski, 1995).

The basic design flaw is the placement of lots next to natural features that create potential encroachment situations. In contrast to backing onto these features, Trushinski (1995) believes it may be much more appropriate to have the development front onto these features in a spatial arrangement of the development, the road, the buffer, and finally the protected feature A trail in this buffer would be acceptable to people, since people are generally comfortable with strangers walking in front of their dwellings

6.3.3 Financial Considerations

Financial considerations are a critical factor influencing buffer creation, especially concerning private stewardship While some similarities exist, different issues and concerns arise between rural and urban areas

Rural

The primary rural perspective is that no matter how desirable buffer strips may be, unless adequate funding is provided as an incentive for establishment, major buffer strip creation simply will not occur. Land owner funding occurs essentially in two forms: funds or provision of materiel for physical buffer establishment; and compensation for taking land out of agricultural production. Funds for physical establishment include aid to purchase grasses, trees, or shrubs. In addition, it can include assistance for installing watercourse fencing to prevent

farm animals, especially cattle, from entering the watercourse, or destroying the buffer through grazing

If a land owner is required to designate and remove a fifteen to thirty metres areas next to either side of a watercourse from agricultural production, compensation becomes an issue Given the difficult economic times that continue to face agriculture, political decision makers are very much influenced by land owner arguments about lost income This aspect has resulted in a slight favoritism for narrower recommended buffer widths on agricultural lands compared to other land uses, as three metres for watercourses and fifteen metres for wetlands are deemed best for Environmental Farm Plan evaluations (Ontario Farm Environmental Coalition, n d c) Other land uses are required to implement wider buffers, usually a minimum of fifteen metres as recommended by the OMNR (1987).

The type of financial assistance is also critical Within the past decade a number of voluntary incentive programs have been offered by both federal and provincial agricultural ministries to assist farmers in implementing buffers These have been met with varying degrees of success. The most recent program is the Permanent Cover (Permanent Pasture II) Program, a three-year program that ended in March 1993 that was created by Agriculture Canada and administered through the Ontario Soil and Crop Improvement Association

For rural areas, tax incentives are also an issue The question arises if a tax break is enough incentive to sway people to implement conservation measures such as buffer strips If an eligible agricultural land owner is already claiming the Farm Tax Rebate, then the only tax being paid is on the buildings, not the land. Thus, if no tax is being paid on the riparian areas where buffers are desired, a tax break is no incentive since the tax break has no value A tax

break only becomes an incentive for non-agricultural properties that have no existing tax breaks

Tax incentives raise revenue concerns for municipalities. Under the current framework, municipalities do not have the authority to grant property tax rebates, as only the province has this power Rebates represent lost tax revenue for municipalities finding it increasingly difficult to generate sufficient funds to provide community services Municipalities resent a burden shift from the province to the municipalities Since its inception in 1988, the Conservation Land Act has provided tax breaks for conservation lands, including woodlands and wetlands However, the likelihood of a program for riparian corridors or buffers is remote, as the province moves to reduce eligible components and is generally moving away from providing tax rebates

Another financial issue for rural municipalities and landowners is social equity The primary rationale for buffers is water quality improvement, while also providing numerous secondary benefits for the broader community. Since the whole community is benefiting, logic dictates that the entire community should share the cost of these buffers. Instead, the financial burden usually falls upon rural municipalities and land owners to create these buffers, although they may not see any direct benefit for their actions Therefore, a method for creating an equitable cost-sharing program must be considered.

Increased consideration surrounding changes to the federal Income Tax Act is evident With such an incentive, the benefits and costs are shared by the community. However, currently those at the top of the stewardship ladder (those that donate property) are disadvantaged by the tax system. The most logical means for the donation of property is through a land trust, which must be registered with Revenue Canada as a charitable

organization under the Income Tax Act However, the Trust must be involved in activities other than just the ownership of environmentally significant property Education must be a main objective as well Changes must be made to make the donation of land an incentive rather than a disincentive Griggs and Wach (1994) provide an example of the net tax position of a person by either donating the land directly or providing a gift of after-tax proceeds The result is twice the benefit from a cash gift rather than land

Urban

Within the urban context, the financial implications are not as critical as in rural areas In urban areas, buffers are almost exclusively the result of new development As a consideration of development, riparian areas are deemed flood plain, and retained by the municipality as hazard land and used as green space While buffers are acquired free of charge, they are usually limited to the flood plain area that may or may not be sufficiently large enough to provide adequate ecological buffering If not, then part of the required five percent land dedication may have to be utilized to create an ecologically sufficient buffer

Ownership raises financial considerations in term of maintenance Unlike rural areas, the riparian corridor in urban areas is usually municipally owned. As such, the municipality and the taxpayers are responsible for maintenance costs Therefore, it is in the best financial interest of the municipality to have a minimal maintenance buffer In recent years there has been a move towards naturalization of stream and park areas to minimize the cost of maintenance inputs such as fertilizer, weed control and grass mowing While this may be a selling feature, it has yet to be seen if naturalization really does result in savings, since real savings only occur with reduced staff to maintain the area (Sleeth, 1995). A natural buffer also has management

costs associated with it, such as the removal of invasive species, dead wood, pioneer species, and litter, as well as management of succession

Urban areas have an advantage over rural areas in securing funding for buffers from NGO's, the community and government programs In the City of Cambridge, the City Green Strategy, a volunteer environmental network, undertook with the K-W Field Naturalists in 1994 the planting of one hundred native hardwoods behind Preston High School adjacent to the Speed River, which can be deemed a buffer strip Nationally, there is Tree Plan Canada, a tree planting program, and Cambridge City Green also received $2,500 from Interprovincial Pipelines that the company provides to communities all along pipelines for environmental programs (Ionson, 1994). One of the difficulties Ionson (1994) notes is that while environmental program funding often is available, time and staff are required to locate these funding sources, which can place a drain on municipal resources

A serious financial situation facing urban municipalities is watershed planning and the associated expenses Increasingly, watershed/subwatershed studies are required for development, but who should pay for the studies remains an issue. Presently, the province contributes to these studies, but as funding cuts continue and more municipalities undertake studies, this source may be limited, and the cost transferred to the developer and municipality. Some taxpayers may contend that if a study is required for development, it should be the developer who pays This raises the issue of equity - should a developer be required to pay the entire cost of a watershed study if the development site is only a small portion of the watershed, and then be required to pay for a subwatershed study for the specific development site area? Developers are often viewed as wealthy and able to afford such studies. In reality this is rarely the case. More commonly, the developer's money is borrowed from banks and

financial institutions that do not fund watershed studies - a fact Trushinski (1995) notes that many at the provincial level are unaware of. Limited municipal resources make independent undertaking of these studies unlikely, and if these studies are required, the province must be financially involved

6.4 Policy Issues

This research has revealed a difference in opinion on the need for and nature of a guiding policy statement for buffer zones. Concerns are raised by Cooper (1994) and Ionson (1994) about any policy expressing a fixed width buffer. They would prefer a variable buffer width based on scientific criteria such as slope, soil type, and vegetation. Cooper cites the current failure to consider buffers scientifically as one of the major downfalls of the current system, although he is unsure if this problem can be adequately addressed in a policy statement. Additionally, the critique is made that planning is lagging behind policy statements. Cooper notes that fixed buffers should not be used, but it is difficult to incorporate flexible features such as a variable width buffer into the planning system as planners find it hard to accept features that are difficult and expensive to survey and incorporate into legal documents. As a result of the uncertainty of what is required for a buffer width, the tendency has been to err on the side of caution by asking for thirty metres around wetlands when this may be over-buffering.

Generally, there is a need to have a guiding policy that serves to coordinate buffer zones in the province. Duke (1994) summarizes the need for a policy in that universal application of the criteria requires direction in the form of a statute or policy. If buffers are left to individual municipalities, a range of responses to the buffer issues will emerge. If the desire

is uniformity for either a watershed or the province as a whole, then there must be some form of criteria in place to know if broader objectives are being met

The new Natural Heritage Policy Statement refers to buffers within the context of corridors, but from a land use planning standpoint, it does not apply to agriculture. However, this is only one area for a buffer policy, as land use planning has limitations. Another problem is the impact of the new policy statements, as Cooper (1994) wonders how these policies are going to work in the long run A guiding policy at the provincial level should serve as a general guide, but leave implementation to the local agencies and municipalities This policy must be accompanied by guidelines, according to Gosselin (1994), to assist local representatives in implementing by providing concrete examples As Trushinski comments, many municipalities do not have a planner on staff, and many of the planning functions are done by the clerk. These guidelines would include research on a scientifically defensible buffer (soil, vegetation, slope, etc) that could be applied to of similar circumstances. This research and development function should be the provincial role, according to Trushinski. This policy should be coordinated for program delivery so establishment occurs in an orderly manner. This would involve a round table approach to develop plans and strategies with relevant agencies and the public integrating all concerns

Ultimately, buffers are a land use issue that affects municipalities. Therefore, Ionson (1994) believes the municipality should assist in the development of rules. She envisions this as a Planning Act policy that provides a framework for regional and local municipalities to develop riparian buffer zones policies. This view of a broad, general policy allowing municipalities to localize and make more specific policy is an idea supported by Ionson, Gosselin, and Trushinski

However, not everyone is convinced that a policy is needed Graham believes policy is not yet required, but that more time should be given to allow volunteer action and education a chance, such as making the EFP a requirement before major funding initiatives are granted to a property owner Graham (1994) is also critical of some Planning Act policies as being written by people in urban areas who cannot appreciate the negative impacts these policies can have on rural and farming communities Minshall (1995) is also equally skeptical of policy, questioning if it real helps, but that the people actively involved in issues like buffers on a daily basis must be convinced about the merits of a buffer In a rural perspective, Dembek (1994) states that a policy will only work when development is occurring, and that policy can be issued under section 3(1) of the Planning Act, but is not worth having if it cannot be implemented

When considering a policy for riparian buffers, several options exist (Table 6.8) The most basic option is to continue the status quo and to have no specific riparian buffer policy This option has the advantage in that it requires no action to implement, and it allows the recent policy statements of the Planning Act to take effect However, serious negative impacts exist as buffers are implemented without any clear direction, as evident by the various recommendations of government agencies Water quality is still a major concern to municipalities, as evident in the draft Official Plans of the Region of Waterloo and the County of Oxford. To mitigate this problem, buffers are recommended as a BMP

The placement of a policy within the confines of Section 3(1) of the Planning Act has the advantage that it allows for a common buffer policy within the province Such a policy would be part of an existing framework, such as the Natural Heritage Policy, and therefore easy to implement. However, several limitations exist for locating a policy solely under the Planning Act. First, land use planning is only one aspect of buffer zones and does not address other issues such as species composition or management implications Additionally, land use planning affects uses of land, not activities practiced upon that land This includes the presence

Table 6.8 Policy Options

Option	Positive	Negative
Status Quo	* requires no change in the current situation * no policy creation necessary * allows new policy statements to take affect	* buffers are being input with no coordinated strategy * water quality still a major issue * buffers advocated as BMP's
Planning Act (Section 3.1)	* common policy for land use planning * part of existing framework	* land use planning only one aspect of buffer zones * land use planning of limited value
Common External	* could be considered as part of the Planning Act * integrated and common strategy * coordinated funding programs * legislation in place * can be coordinated through EBR	* requires considerable coordination * more rigid and inflexible
Individual Institution	* fits each ministry's concerns in * adopts each sectors concerns	* individualism leads to no organized strategy * sporadic implementation * strategies may be counter-productive * lack of consistency
General Policy	* adaptation to local circumstances * no #'s allow flexibility * based upon science * greater public participation	* creates a variation based upon local conditions * doesn't always allow view of larger picture
Specific Policy	* ensures consistency, eliminates vagueness * ensures broader objectives are met	* requires major institutional involvement; monitoring to ensure consistency and compliance * standardized planning * fixed width

Source Author

or absence of a landowner using BMP's for the land. Second, land use planning is of limited value, as it does not address the problem of legal non-conforming uses, nor the fact that

agriculture is not considered development, even though farming activities can have as much impact upon the environment as development

A third option is to have each institution or agency adopt a buffer policy This allows each ministry or agency to focus upon its specific concerns and to adopt a policy to address these concerns, such as fisheries for the OMNR and agriculture for OMAFRA This is reflected in the current recommendations provided by the various agencies However, this individualism results in no organized strategy regarding buffers, or strategies that may be counter-productive, as evident in OMAFRA and OMNR differences on species composition and recommended widths and resulting impact upon fisheries Such individualism can result in sporadic implementation, as the incentive programs have resulted in regional variations in acceptance, such as the those problems noted by Graham of implementing the Permanent Cover II program on Manitoulin Island. This individualism also results in a lack of consistency, especially at the local level, for implementing buffers. For example, the City of Waterloo desires buffers on its portion of the Laurel Creek Watershed, but the surrounding townships in the upper watershed see no urgency for buffer implementation

The fourth policy option is for a common external policy that is adopted by the various agencies and institutions. An integrated policy could use and combine resources, reducing duplication, including the coordination of funding programs, such as the EFP and CURB The framework for creating a common policy is essentially in place, through much of the non-specific legislation, and the Inter-ministerial Committee created under the EBR that could coordinate and adopt a common policy for institutions and agencies. In this respect, a policy for the OMMA could appear under Section 3(1) of the Planning Act and apply to municipalities, even though they are not directly affected by the EBR Such a common policy

is not without disadvantages It requires considerable coordination for implementation, most notably through the process of watershed planning that requires consensus building This consensus building also results in a policy that is more rigid and inflexible than other options, as each institution's concerns may not be completely addressed to its satisfaction

Two options exist for this type of policy: a general policy or a specific policy (Table 6 8) A general policy has several advantages, with the most important being the ability to adapt to local circumstances. A general policy does not specify particular widths, overcoming the problems of fixed buffers, and can be based upon science A general policy also allows greater public participation than a specific policy, such as through the process of watershed planning, and general policies are consistent with recent provincial direction on policies, as evident in the comprehensive policy statements issued under the Planning Act However, a general policy allows variation based upon local conditions and desires. This primarily occurs through local planning and the resulting boundary problems. As such, it does not always allow a view of the larger picture, including cross watershed planning and natural heritage planning.

By contrast to a general policy, a specific buffer policy would ensure consistency and eliminate the vagueness that results when room is left for interpretation for local adaptation. It also ensures that larger objectives, such as a natural heritage framework, are being met. The disadvantage of a specific policy is that it requires major institutional involvement for monitoring to ensure consistency and compliance. This institutional involvement was the situation in the previous Planning Act situation, which the province is trying to reduce. Such a specific policy also has the problem of standardizing planning, which is not always appropriate. An application may not be appropriate to every situation, as an implementation method may not be appropriate for both Windsor and Ottawa. Linked to this is that a specific policy

specifies a fixed width for the buffer, that is arbitrary and not based upon science As a result, the buffer may be wider than necessary in some situations, yet not wide enough in other circumstances

6.5 Conclusions

Many issues are involved in the management of buffers Many are interdependent and thus, cannot be separated in considering a management framework They reflect current arrangements for riparian buffers (Objective One) Additionally, many of these issues have several options that could be used, each with opportunities and constraints (Objective Four)

The management of buffers must incorporate several important factors First stewardship is a major component. Given the large area of private lands in the watershed, it will retain a key role in the future and must be considered To assist private land owners and public managers, these buffers should be naturalized to allow for minimal maintenance This will reduce costs both in terms of labour, and financial savings as well

Two almost inseparable functions are monitoring (a management function) and enforcement (a legal function) Monitoring is a crucial function to determine if project goals and objectives are being met, and to determine if compliance is being achieved This is a necessity if the review process by provincial agencies is removed from the planning process and if financial incentives are offered to aid buffer creation Monitoring is a function that could be integrated among the various agencies, and involve the public (citizens, NGO's, educational institutions). While public involvement is desirable for monitoring, it is not desirable for an enforcement role, although the public can greatly assist enforcement by reporting incidents Among the agencies, there is potential to integrate the various officers responsible for various

statutes, especially since must of the legislation does not have ministry-specific enforcement officers This would reduce the duplication in spatial area covered, allowing agencies to maximize limited resources

An integrated management approach requires the use of a lead agency. For buffers, this function should be left to the provincial agencies based upon the limited responsibilities of the local municipalities and boundary problems. Of the provincial agencies, the OMNR and the GRCA are the most promising lead agencies, with the GRCA the most desirable based upon cross-boundary contacts, past role with buffers, and a structure based upon the watershed (a natural ecological unit)

Boundary problems are an issue that must be overcome, especially municipal boundaries The best way to accomplish this is through an integrated planning approach for ecological features such as buffers, with the watershed/subwatershed being appropriate for buffers based on hydrologic reasons. By planning on natural units, the deficiencies of planning within artificial administrative boundaries for buffers should be overcome.

Legal issues include official recognition, and financial considerations For recognition, options range from no recognition to legal status. Virtually no buffer recognition exists in rural areas except for stewardship initiatives. In developed areas, the riparian lands are hazard land, taken by the municipality and generally zoned 'open space' However, this designation does not specifically protect a buffer.

The second legal component is financial. Incentives for buffer creation are almost absent, with minimal funding provided by the CURB program, and the EFP program. Buffers are not considered from a tax incentive perspective, as only limited programs are available under the Conservation Land Act, and these programs are being reduced. In rural areas,

further tax breaks are not an incentive to create buffers if the land owner already qualifies for the Farm Tax Rebate.

From a policy perspective, buffers lack a clear direction The current situation is one of many agencies desiring buffers for different purposes. However, no formal policy exists The OMNR comes the closest provincially with the vegetative buffer guidelines, but these are not actual policies. At the municipal level, the City of Waterloo and the County of Oxford are developing policy on buffers However, even these buffer policies vary in approach with the City of Waterloo using a fixed buffer and Oxford County using a variable buffer The most desirable option is a common general policy that allows for consistent principles, while being flexible and adaptable to local circumstances.

Chapter Seven

Conclusions and Recommendations

7.1 Introduction

This research details the opportunities within the current institutional arrangements for riparian buffers in the Grand River watershed of southern Ontario. The purpose has been to examine which elements of the current management arrangements (legal, administrative and financial) facilitate and/or hinder an integrated approach for environmental management of riparian buffer zones. This has been examined through a literature review, interviews with institutional and associated representatives, and an analysis of associated legal and administrative arrangements

To discover opportunities, benefits, and problems of an integrated approach for buffer management, five research objectives were identified. The first was to identify the current institutional arrangements of various government agencies as they apply to riparian buffers in Ontario. The second was to examine the problem of inconsistent institutional and ecological boundaries. The third was to determine the degree of integration among government agencies with regard to buffers. These three objectives were fulfilled through use of the analytical framework, and since they do not relate to specific recommendations, they are presented in a separate section. Once the first three objectives were completed, the final two objectives, to identify opportunities and constraints for integrated management, and to propose an integrated buffer management framework, could be accomplished. These objectives, especially the latter, lend themselves to recommendations

based on the findings and conclusions of the first three objectives The research considered an analysis of the institutional framework and management concerns that must be addressed in an integrated riparian buffer management framework Recommendations are proposed for a framework concerning riparian buffers

The following discussion also considers limitations of this research, and potential areas of further research that either must be addressed to make an integrated buffer management strategy succeed, or could be undertaken for academic research purposes

7.2 Key Findings and Conclusions

The first research objective was to identify the components of the current institutional arrangements for riparian buffers in Ontario. The first key finding is that several provincial governmental agencies and the municipalities create a fragmented management framework, with a wide diversity of overlapping mandates and responsibilities affecting the creation or management of riparian buffers Buffers have been promoted by provincial agencies as a BMP, but buffers are a land use that involve the local municipalities through land use planning.

A second key finding is that despite the variety of agencies involved, no explicit policy regarding buffers exists at the provincial level. The OMMA has the Natural Heritage policy, within which buffers are defined within the context of corridors The OMNR is the provincial agency closest to a policy with its vegetative buffer guidelines In the municipal case studies, only the City of Waterloo in its Official Plan Amendment No 16, and the County of Oxford in its Draft Official Plan have explicit buffer policies

Many organizational and management structures exist for planning and managing buffers within the various governmental agencies. However, these structures are generally isolated from one another across the institutions Therefore, it can be concluded that these structures could integrate functions and legitimation considerations into a more efficient framework, such as with monitoring and enforcement functions

Like structures, many statutes were found applicable to buffers and could be used to facilitate buffer creation and protection. One of the most influential is the Fisheries Act that is the OMNR's primary interest in riparian buffers. Proactive enforcement of the Act could persuade landowners to implement buffers. The application of the Lakes and River Improvement Act is also one means to achieve buffer creation on a broad scale, although it has not been used as such. However, some legislation, such as the Weed Control Act, can have a negative influence on naturalized buffer creation. Therefore, it may be desirable to alter this statute to aid naturalization efforts, which affect both buffers and other naturalization efforts. The Drainage Act also deters buffer creation along municipal drains. For management functions, such as enforcement, the statutes are non-ministry specific regarding enforcement officer designation, and therefore this function could be integrated for many statutes. It is concluded that sufficient legislation is currently in place; better use of this legislation is needed.

Buffers impact land use decisions as an ecological feature . This role should be reflected through land use planning. However, this is not the case. The new provincial policy statements do not directly mention buffers, but consider them under the context of corridors. In municipal documents, such as the County of Oxford's Draft Official Plan,

buffers are directly mentioned However they are not officially or distinctly recognized for zoning purposes. Another key finding is the limitation of land use designations While land use planning designates use of the land, it cannot control land use activities, a problem for several reasons. First, for multiple purpose buffers, composition and secondary activities are not land use decisions, and a merging of activities and land use is necessary to ensure an adequate buffer is created and maintained Second, buffers are impacted by the activities or practices on adjacent lands, as this affects the necessary buffer width to mitigate the impacts of these activities

An additional key finding is that a major limitation exists in the official recognition and protection of buffers. Buffers as a specific entity are not generally recognized The only legal way of implementing buffers in the current situation is through development, or when a change in land use occurs, and the buffer is generally limited to floodplain lands In these situations, the lands are generally zoned 'open space', the same as park land, and subject to active recreational uses. In rural areas, while it is possible to create general buffers along stream corridors through zoning, there is no legal method to enforce these buffers as existing uses are considered legal non-conforming Only when a change in land use occurs, such as a zone change or severance, can a buffer be imposed At this time, a conservation easement could theoretically be registered against the deed, thereby offering long-term protection. A buffer can also be officially recognized if the landowner takes the initiative and has a conservation easement registered against the property deed

A key limitation is a lack of financial support for buffer creation through incentive programs. In rural areas, the only programs are the Environmental Farm Plan ($500

maximum), and the CURB program. Buffers can be created as part of the latter by allowing up to 75% of the cost of fencing watercourses. No programs for general buffer creation, like the Permanent Cover programs, have been established Urban areas are limited to special programs, such as Tree Plan Canada, to aid establishment. From a tax incentive perspective, no program exists. One tax break that potentially could be utilized is the Conservation Land Act, but eligible programs are being eliminated. In rural areas, land owners receiving the Farm Tax Rebate are not paying tax on riparian lands, therefore additional tax breaks are not an incentive. Given the large areas of privately owned riparian lands and the lack of governmental resources to directly purchase or manage potential riparian buffers, incentives promoting private stewardship are necessary.

A key finding is that in southern Ontario buffer creation needs to depend heavily upon private stewardship. Much of the Grand River watershed is privately owned, and therefore, it is important to encourage private stewardship. This has been the approach of OMAFRA. Thus, it is necessary to have incentive programs to encourage stewardship in rural areas where riparian lands are largely privately owned.

The last key finding is the movement towards watershed planning. This is required to plan and manage on an ecosystem basis, an approach adopted by several ministries. As the primary buffer function is water quality improvement, using the watershed as a planning unit is an excellent choice. However, multiple use buffers, such as wildlife corridors, may require a different management scale, such as the bioregion, to deal with wildlife movement across watersheds.

The second research objective examined the problems related to institutional arrangements conflicting with ecological units as they apply to buffers The major problem is a lack of continuity across administrative or political boundaries for environmental issues. For municipal land use planning, a municipality only plans for what it has jurisdiction for, as it cannot plan beyond its borders Thus, the environmental planning problem is that planning stops at municipal boundaries For example, the City of Waterloo has implemented buffers for the Waterloo west side to improve water quality and deal with erosion concerns. However, erosional problems are also the result of activities in the headwater townships, which do not see any urgency to implement, nor have the ability to legally implement buffers. However, in this example the upper tier municipality (Region of Waterloo) could intervene and coordinate the municipalities for buffer creation. However, problems develop when upper tier municipalities come into conflict A watershed study crossing upper tier municipal boundaries may recommend buffer creation, and one municipality may incorporate this recommendation into its Official Plan, but no requirement exists for the other municipality to follow with a similar adoption.

One popular method for dealing with cross-boundary issues is watershed planning This process brings relevant stakeholders together to develop a common plan Through this process, buffer strategies and recommended uses could be determined based upon site specific information. The process is becoming institutionalized for land use planning, as evident in the support for watershed/subwatershed planning in the Region of Waterloo's Regional Official Policies Plan and the County of Oxford Draft Official Plan However,

wildlife planning may require a different scale. Thus, wildlife corridor planning will require incorporating broader natural heritage considerations into buffers.

The third research objective considered the level of integration existing between institutions for buffers. At the provincial field office level, improvements are necessary to facilitate links. A major finding is that despite the role of buffers in controlling non-point source pollution, the MOEE is absent in the promotion of buffers, as locally they have not requested a buffer. The MOEE's CURB program does not directly promote buffers, as the closest funding option is for watercourse fencing. This program is not even a local integration link, as the program is locally administered by the GRCA. There is also no contact with the local MOEE office and the GRCA for buffers

A second key finding is that the OMAFRA has some links for the establishment of buffer zones, including links to the GRCA through the Beaver Creek demonstration project However, these links are minimal at the local level and need to become more regular rather than focusing on individual projects. In promoting a stewardship approach, OMAFRA has focused attention on partnerships with NGO's, especially the Ontario Soil and Crop Improvement Association, instead of interaction between agencies.

The most successful integration is between the OMNR and the GRCA. This linkage is largely due to the similarity in mandates regarding water management, combined with the organizational and financial connections of the GRCA to the OMNR. The two agencies also have a protocol regarding wetlands and who takes the lead. It is usually either or both of these agencies that recommend buffer creation.

At the upper provincial level, a finding for integration is an Inter-ministerial Committee established under the Environmental Bill of Rights Act This committee brings together the ministries identified in the statute to foster a continuous dialogue on the development and application of the Statement of Environmental Values for the ministries Therefore, this is one forum that could be utilized to create an integrated provincial buffer policy to be then implemented by the various applicable ministries

At the municipal level, it was found that few links exist between municipalities at the same level. Little interaction exists among lower tier municipalities, and among upper tier municipalities. Informal contact does exist, such as the Regional Planning Directors meetings, and through communication when issues arise, but no regularized and formal interaction exists. Within the Region of Waterloo, the Area Planners is a potential group to facilitate contact and communication on common environmental planning issues among lower level municipalities. However, this group is presently inactive The strongest environmental link is between the upper and lower tier municipalities, as the upper tier creates policy direction for the lower tier

In terms of links to provincial agencies, the municipalities have a close link to the OMMA through Official Plan approval, dispute resolution (OMB), and the Planning Act In this respect, the OMMA has power over buffers as a land use through Official Plan approval, the policy statements in the Planning Act, and OMB decisions For buffers, municipalities also work closely with the OMNR and the GRCA (Conservation Authorities in general), as evident in the consultation procedure for determining an appropriate buffer within the County of Oxford Draft Official Plan

The last key finding is a move towards watershed planning. This reflects the move towards an ecological planning approach, and represents a move to integrate planning among the various institutions and stakeholders. Thus, environmental planning in the current context is evolving towards an integrated management and planning basis, a move that is positive for planning and managing environmental features like buffers.

7.3 Recommendations

The fourth research objective was to determine the opportunities and constraints existing among the agencies for establishing an integrated riparian buffer approach. These have been considered in the previous chapters to facilitate research objective five, the recommendation of an integrated management framework for buffers. Twelve recommendations for a management framework are presented below.

1. Watershed Planning: This process allows for an integrated planning approach of ecological features and reduces the deficiencies of planning on artificial administrative boundaries, especially municipal boundaries. The watershed is the best unit to plan buffers based on hydrologic considerations. By using watershed planning, relevant institutional and public stakeholders participate in the process, allowing buffer creation based on local goals and objectives, including consideration of buffer composition and uses. This brings the agencies together to interact on buffers at the local level, and will facilitate contact and linkages for buffers that are currently in need of improvement. This watershed plan must

reflect concerns of other ecological contexts, such as natural heritage systems, if wildlife corridors are considered.

Recommendation: That watershed planning be used as the context to implement riparian buffer zones.

2. Stewardship: Stewardship is a major part of the current management situation, and given the extent of private land in the watershed, it will retain a key role in the future Therefore, private stewardship must be incorporated and encouraged in future management frameworks for buffers. This also fits with the OMNR's desire to increase the public's responsibility in natural resources management. To aid private land owners and public managers, these buffers should also require minimal maintenance This will reduce both financial and labour costs.

Recommendation: That a process of integrated stewardship be applied to riparian buffer zones that attempts to maximize the benefits of private and public stewardship while minimizing the negative aspects.

3. Lead Agency: The coordination of an integrated management approach requires the use of a lead agency. For buffers, this function should be left to the pr' vincial agencies based on the limited responsibilities of local municipalities and boundary problems Of the provincial agencies, the OMNR and the GRCA are the most promising lead agencies, with the GRCA the most desirable agency based on cross-boundary contacts, past role with buffers, and a structure based upon a watershed (a natural ecological unit).

Recommendation: That the GRCA assume the lead agency role for buffer zone creation and establishment, and coordinate the monitoring and enforcement activities.

4. Monitoring: Monitoring must be undertaken to determine if project goals and objectives are being met, and to determine if compliance is being achieved. This is a necessity if the provincial review process is removed from the planning process, and if financial incentives are provided for buffer creation. Monitoring is a function that could integrate agencies, and involve the public (citizens, NGO's, educational institutions).

Recommendation: That an integrated monitoring system be developed that utilizes the relevant agencies (based on roles and mandates), groups and individuals.

5. Enforcement: While public involvement is desirable for monitoring, it is not desirable for enforcement. The public can assist enforcement by reporting incidents to proper enforcement personnel. Among the agencies, the potential exists to integrate enforcement officers since much of the legislation is not ministry specific for enforcement. Integration can enhance management by reducing the duplication in spatial area covered, and allows agencies to maximize limited resources.

Recommendation: That integrated enforcement for buffers be pursued.

6. Maintenance: It is in the interest of private individuals and agencies to support a buffer that requires minimal maintenance. This will ensure minimum financial, labour, and time costs for maintenance. This will gain public acceptance and support, especially if

maintenance is undertaken through private stewardship The level of maintenance is also dependent on the composition and setting of the buffer A naturalized buffer requires less maintenance than a manicured/managed buffer, and urban buffers tend to require slightly more maintenance than rural buffers to mitigate safety considerations.

Recommendation: That buffers strive to be the minimum maintenance level This will ensure minimal maintenance costs while maintaining public acceptance

7. **Retrofitting:** Retrofitting is important for existing development Since some buffer is better than no buffer, and the difficulties of retrofitting in existing development (the potential lack of land to create a buffer, a lack of public acceptance for buffer creation, and the questionable impact if not utilized in conjunction with other stormwater management options), buffers should be implemented when opportunities arise These opportunities should be identified through a watershed/subwatershed While the impact of sporadic implementation may be questioned, the long-term situation must be considered While of limited value today, after many years of effort, the cumulative impact will become noticeable. The initial steps must be taken now.

Recommendation: Given the debatable impact of retrofitting buffers into urban or developed areas, it is recommended that a process of limited retrofitting occur

8. Buffer Width Models

Several models exist for buffer width. Although the variable model is ecologically the best design, and institutions have favoured a fixed model, the variable-fixed model

offers a compromise. This provides a minimum level of water quality protection, while allowing expansion if circumstances require. The fixed component can be based upon general characteristics, such as slope and soil type. for a municipality This model also allows for reasonableness, affording a level of water quality improvement from the fixed component, and thus, a defensible buffer.

Recommendation: That a fixed-variable width model be adopted for buffers.

9. Recognition: For recognition, options range from no recognition at all to full legal status Virtually no buffer recognition exists in rural areas, except for private stewardship initiatives such as conservation easements. In developed areas, such as urban centres, riparian lands are considered hazard land, and taken over by the municipality These lands are generally zoned 'open space' which does not specifically protect a buffer, as it is treated the same as parkland. Ultimately, some form of legal status is preferable for long-term protection, with full legal protection the most desirable.

Recommendation: That buffers be given the highest level of protection that conditions permit. The establishment of land trusts for management of these lands is an excellent opportunity to protect the land and allow multiple objectives.

10. Financial: Virtually no funding or incentives are available for buffer creation. The only programs existing are aspects of the CURB program and through the Environmental Farm Plan program. However, these programs provide minimal funding. From a tax incentive perspective, buffers are not favoured, as only limited programs are available

under the Conservation Land Act, and these programs are being reduced. In rural areas, further tax breaks are not incentive to create buffers if the land owner already qualifies for the Farm Tax Rebate. Changes in financial assistance must occur in the future if private stewardship is to be pursued, such as changes to the Income Tax Act to make the process more equitable, and further incentive programs to aid land owners in establishment

Recommendation: To promote buffer through private stewardship, financial incentives (especially incentive programs, such as the Permanent Cover programs) should be provided to private land owners.

11. Policy: From a policy perspective, buffers lack clear direction. The current situation has many agencies desiring buffers for different reasons. However, there is no official policy for the ministries regarding buffers, although all ministries consider buffers as desirable Therefore, it is important that a policy be coordinated among these ministries to ensure that consistent and compatible objectives can be met. The most desirable policy option is a common policy that allows for consistent principles and multiple objectives while adapting to local circumstances.

Recommendation: Despite the coordination and rigidity of a common external policy, this option should be pursued in a riparian buffer zone management framework It ensures a broad level of consistency across the province on both policy and program delivery, while implementation of a policy can occur within the existing framework

For policy, two options are possible specific and general. A specific policy usually is associated with a fixed width design by specifying set widths. In contrast, a general policy provides general direction and considerations and allows a buffer to conform to local conditions and circumstances.

Recommendation: Based on the previous recommendation of a fixed-variable buffer design, a general type policy for riparian buffers should be adopted.

12. Use of the EBR: A potential coordination vehicle for a consistent provincial policy is the Interministerial Committee created under the EBR. This would allow the creation of a common buffer policy to be channeled through the relevant agencies. Although the EBR does not directly affect municipalities, policy could include them by the OMMA incorporating policy into provincial planning policy statements under the Planning Act.

Recommendation: That the EBR Interministerial Committee be considered for the coordination of a common riparian buffer policy/strategy for provincial agencies.

Three of these recommendations should be given a high priority. lead agency, monitoring, and watershed planning. A lead agency must be established to coordinate the agencies in developing a common strategy for buffers for an integrated approach, and potentially a common policy on buffers. The lead agency will also aid in coordinating key functions, such as monitoring, that is required for research on buffers, and ensure information is distributed through a central source.

Second, monitoring must be undertaken for new and established buffers This will allow baseline monitoring for new buffers, and the long term impact and effectiveness of established buffers This monitoring will be useful for research developing a buffer based upon science, and research on what is needed for a buffer (width and composition) is a high priority. Monitoring is also crucial for determining compliance for financial incentive programs, and to determine if buffers are being damaged by encroachment

Third, buffers must be undertaken using watershed planning This will allow multiple use buffers to be considered within the framework of larger goals and objectives The process also coordinates planning and objectives by bringing together the relevant agencies, thereby helping to resolve cross-boundary issues

7.4 Research Limitations

While this thesis has attempted to provide a thorough analysis, limitations must be recognized Perhaps the most notable limitation is the scope With the focus upon the institutional aspect of the management situation, the view of the private sector has not been fully explored. While an attempt has been made to make inferences about the private sector situation from the institutional and literature sources, primary accounts of this sector are absent. This limitation could be rectified by exploring the private sector aspects of a riparian buffer zone management framework.

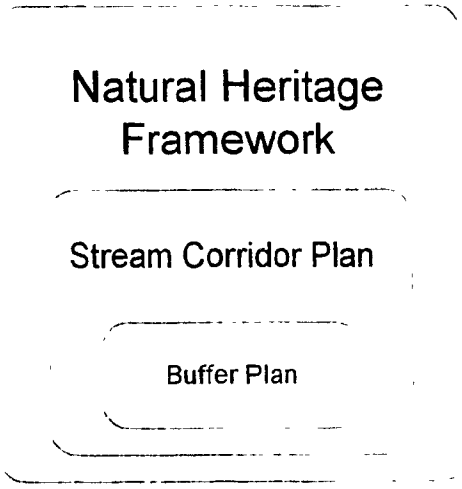
A second limitation exists in the choice of municipalities for the study The Regional Municipality of Waterloo has a long environmental tradition that may not be representative of the other municipalities in the watershed. Similarly, the County of

Oxford, is unique in the province as the only Restructured County, and thus may not represent the situation of other counties that still require restructuring. Additionally, each municipality chosen either has implemented, or is in the process of implementing, new Official Plans that reveal a heightened recognition of environmental issues. This study does not represent those municipalities that utilize Official Plans that have not been updated to reflect environmental concerns, or the new changes in the provincial policy statements

A third limitation is the problem of agency and ministry restructuring. To understand the institutional framework, stability in the framework facilitates analysis. Since the start of the initial research, the Ministry of Environment and Energy, the Ministry of Natural Resources, and the Grand River Conservation Authority each have been restructured, making it difficult to ensure all recent changes have been considered.

Lastly, a reminder more than a limitation, is the position of buffer zones in the broader management context (Figure 7.1). The framework reflects the integrated aspects required for the management of a particular environmental aspect, riparian buffers. This must be viewed within a larger management context involving stream corridor management, and the broader natural heritage management framework.

Figure 7.1 Context of Buffer Zone Planning



Thus, buffer plans and management must be integrated within these other management plans and not viewed as a management entity unto itself

7.5 Recommendations for Future Research

This research has not exhausted the discussion on an integrated approach or buffers. Lammers-Help and Robinson (1991) included seven recommendations in their report that still require attention:

1. How can they [buffers] be used effectively in the upland areas of the province where flow tends to concentrate in natural drainageways prior to entering watercourses?
2. How effective are buffer strips during the winter and early spring when vegetation is dormant?
3. What is the ability of limited-width buffer strips in removing fine particles? That is of particular importance in the lowland areas of the province with heavy clay soils such as Essex, Lambton, and Haldimand counties.
4. Most experiments have been short term. What is the long-term effectiveness of buffer strips? What is the fate of organic material trapped in the filter? Are nutrients re-released into runoff flows? What impact do buffer strips have on subsurface water quality due to increased infiltration of runoff water and associated pollutants?
5. Simple design criteria which consider particle size, nitrogen, phosphorous, pathogens and pesticides under various site-specific conditions such as topography and soil texture are needed in order to utilize buffer strips effectively.

6 What is the effectiveness of buffer strips with respect to the removal of pathogens (if they are a problem) and pesticides?
7 What tree and herbaceous species are most suitable for vegetative filter strips here in Ontario?

To this list there are several additional topics that this research has discovered that must be considered regarding buffer zones in the Ontario context. The first and foremost recommendation is that research must be conducted to determine a scientifically defensible buffer width based on geologic and biologic principles This must also consider the impact of a multiple-use buffer on buffer size, such as how much wider need a buffer be to maintain ecological functions and also provide a community trail? Surprisingly, there have been a number of buffers implemented through demonstration sites and government programs Yet, these sites are not being readily monitored and evaluated as to effectiveness. This research should be undertaken.

While beyond the scope of this study, a more in-depth exploration of the organizational culture of the various ministries, especially the local delivery components is imperative This would aid in the understanding of the conspicuous absence of the MOEE from the local scene for management purposes and potentially establish refined links for a proposed integrated management framework.

Lastly, this study has focused upon the institutional aspect of the management situation. This only presents part of the context. Further research should be conducted to determine land owner and private sector (NGO's included) perspectives on buffers. Additionally, the role of the First Nations in a management framework requires attention, especially with respect to the native reserves located within the Grand River watershed. These actors are integral to a complete integrated management framework.

From an integrated management perspective, several research topics need attention. There is currently a heavy focus upon public participation in the management of natural resources at all levels of government. This will need exploration over the long term to see what impact the public will play in management activities and if the public interest can be sustained. Likewise, recent innovations discussed in this research study require revisiting. The Environmental Bill of Rights and the accompanying Interministerial Committee require examination to determine how effective they are in the coordination of environmental activities amongst ministries. This may not be evident for several years Similarly, the new provincial policy statements of the Planning Act require consideration to determine if the new policies meet the environmental objectives they are designed to provide.

Appendix A Interview Questions

General

1 What do you perceive as being the main riparian buffer zone management issues to be addressed in Ontario? What are some specific examples of these issues?
2 Are existing legal and administrative arrangements able to facilitate the handling of these issues, or are there specific changes that should occur that would be beneficial? How effective are these current arrangements?
3 Should there be an official policy or objective statement that serves as a guiding principle for riparian buffer zone management decision making in the province? Who should manage/maintain this policy/objective statement? Should it be included under Section 3(1) of the Planning Act?
4 Do you think it would be possible to successfully develop an integrated strategy for riparian buffer zone management in Ontario? And implement it? Should planning be on a watershed or sub-watershed basis? Why? Can you provide examples for your opinions?
5 Should financial incentives be provided to encourage riparian buffer zone establishment? If so, what type of funding? Please provide examples of the type of assistance.
6 Do you feel one agency should play a lead agency role, and if so, who should play this role? Why?
7 Who should be responsible for the maintenance of the buffer and associated costs? Why?
8. Perhaps one of the most profound obstacles to integrated management is the issue of boundaries Rarely do artificially created agency and political boundaries coincide with natural ecological boundaries. How can this be overcome?
9 Should land ownership and adjacent land use impact on the decision making process for determining buffer dimensions? i.e. should agricultural land be given special consideration compared to other land uses.

Municipal

1 There is an increasing recognition that land use planning should occur with an ecological basis. Currently, the ecological planning unit being favoured is the watershed and sub-watershed. Do you feel this is a feasible and desirable objective? Why?
2. What functions should the buffer provide? (i.e. ecological, agroforestry, wildlife corridor, recreation)
3. How are buffers currently recognized by the municipality? How should buffers be officially recognized and protected?
4 What efforts are currently being taken, or could be taken, to coordinate environmental and land use planning activities between adjacent municipalities? What examples specifically?

Field/Operation Level

1 How do you deal with the issue of riparian buffers within your jurisdiction? Do you promote their use? Why or why not?
2 What intra-agency contacts occur for environmental management between agencies operating within the watershed? i.e. between the districts and areas, and the regional level, or between regions.
3 What inter-agency contacts exist for environmental management between the various agencies operating within the Grand River watershed? i.e. MOEE, MNR, OMAFRA, CA.
4 What links exist between your agency and the municipal governments in terms of environmental management and planning?

Appendix B Interview Consent Form

Consent Form

I agree to participate in the research project concerning the opportunities for the integration of riparian buffer zone management being conducted by Mr Jeff King, Wilfrid Laurier University, as part of his Master of Environmental Studies thesis. This research is being conducted under the supervision of Dr. Jerry Hall, Wilfrid Laurier University and Dr. Bruce Mitchell, University of Waterloo. I understand that this project involves my participation in an in-person interview for the purpose of identifying opportunities for the coordination of environmental management and planning with respect to ecological buffer zones. I understand that my responsibility in the research, if I give consent, consists of responding to the interview. I am also aware that superiors may be interviewed as part of the research process.

I understand that I have the right to choose not to give an opinion or response at any point in the interview process, to withdraw my participation entirely, and to request that audio recording (if used) to cease. Moreover, I understand that I have the right to review the researchers written account of my interview, and that the researcher will protect the confidentiality and anonymity of the interviewee if I so choose I am aware that only the researcher will have access to the audio tapes, which will be erased upon completion of the data analysis, and that the transcripts of my interview will also be destroyed upon completion of the research. I am also aware that the researcher will use direct quotes from me only with my written permission and after my personal review of the quotes

I approve of my position being cited in the final report:
Yes _____ No _____

I approve of my name being cited in the final report:
Yes _____ No _____

I consent to the use of an audio recorder in the interview
Yes _____ No _____

Signature _____

Printed Name _____ Date _____

Position _____

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